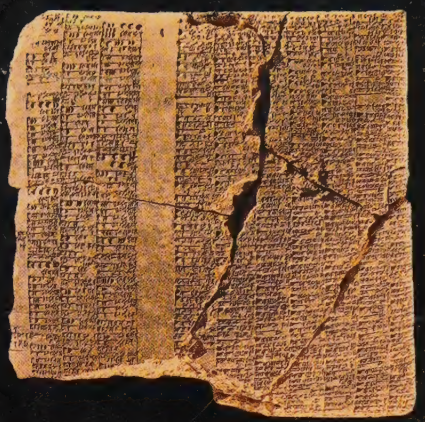

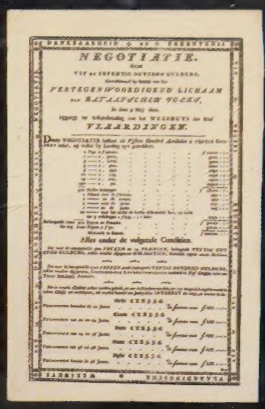

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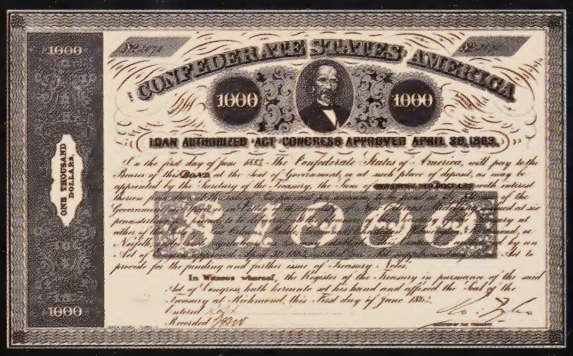
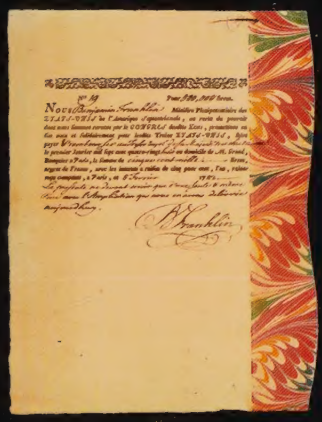
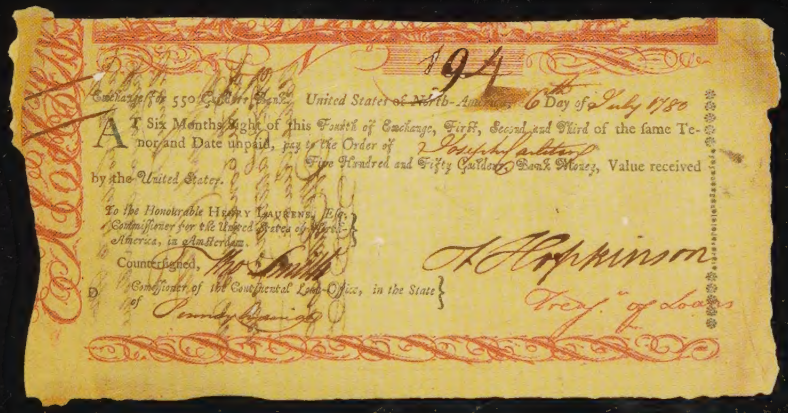


THE ORIGINS OF VALUE

THE FINANCIAL INNOVATIONS THAT CREATED MODERN CAPITAL MARKETS



Exchange for 550 Spanish Dollars. United States of North-America, 6th Day of July 1780
At Six Months Sight of this FIRST of Exchange, (SECOND and THIRD of the same Tenor and Date unpaid,) pay to the Order of
Five Hundred and Fifty Spanish Dollars Bank Money, Value received
by the United States.
To the Honourable HENRY LAURENS, Esq.
Commissioner for the United States of North-America, in Amsterdam.
Countersigned,
Commissioner of the Continental Loan-Office, in the State of Pennsylvania.
Treas. of Loans

INTERNATIONALE 5%IGE ANLEIHE DES DEUTSCHEN REICHS 1930
GERMAN GOVERNMENT INTERNATIONAL 5% PER CENT. LOAN, 1930
EMPRUNT INTERNATIONAL 5% P.C. 1930 DU GOUVERNEMENT ALLEMAND

EDITED BY WILLIAM N. GOETZMANN
AND K. GEERT ROUWENHORST

From the invention of interest in Mesopotamia and the origin of paper money in China, to the creation of mutual funds, inflation-indexed bonds, and global financial securities, here is a sweeping survey of financial innovations that have changed the world.

Written by a distinguished group of experts—including Robert Shiller, Niall Ferguson, Valerie Hansen, and many others—and wonderfully illustrated with over one hundred color photographs of landmark financial documents (including the first paper money), *The Origins of Value* traces the evolution of finance through 4,000 years of history. Readers see how and why many of our most important financial tools and institutions—loans, interest rates, stocks, bonds, mutual funds, the corporation, and the New York Stock Exchange, to name a few—came into being. We see, for instance, how ancient Rome developed an early form of equity finance that resembles the modern corporation and read about the first modern corporation—the Dutch East India Company—and its innovative means of financing the exploration and expansion of European business ventures around the globe. We also meet remarkable financial innovators, such as the 13th-century Italian Fibonacci of Pisa, whose mathematics of money became the foundation for later developments in the technology of Western European finance (and may explain why the West surpassed the East in financial sophistication). And we even discover a still-surviving "perpetuity" dating from the Dutch Age of Reason—an instrument that has been paying interest since the mid-17th century.

Placing our current age of financial revolution in fascinating historical perspective, *The Origins of Value* tells a remarkable story of invention, illuminating many key episodes in the course of financial history.

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The Origins of Value

THE ORIGINS

OF VALUE

The Financial Innovations That Created Modern Capital Markets

EDITED BY WILLIAM N. GOETZMANN
AND K. GEERT ROUWENHORST

International Center for Finance
at the Yale School of Management

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Will Goetzmann would like to dedicate his work in this volume to his father, professor

William H. Goetzmann, whose lifetime of enthusiasm for history was a source of personal inspiration.

Geert Rouwenhorst would like to dedicate his work in this volume to his parents, who encouraged the pursuit of scholarship across disciplines, languages, and borders.

New Haven, 2005

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The Origins of Value

Introduction
Financial Innovations in History

WILLIAM N. GOETZMANN
AND K. GEERT ROUWENHORST

The essays in this volume are written by a distinguished and adventurous set of historians and economists who have been willing, in many cases, to step beyond their typical field of inquiry and explore the historical foundations of financial innovation. First and foremost, the essays are motivated by the need to place our current age of financial revolution in historical perspective. Innovations in the modern world of finance have come to be almost expected, financial instruments spring from the mind of investment bankers almost overnight, and then are analyzed, valued, traded, saved, and hedged themselves—sometimes to be replaced by new financial instruments, and other times to be part of the permanent toolkit of financial engineers and investors. This continuing process of innovation, as sophisticated as it may seem to most of the modern world, is in fact built on surprisingly few basic principles.

This book traces the evolution of these basic principles of finance through 4,000 years of history—to the dawn of writing. Financial technology is based upon the ability to record agreements—whether on clay tablets, notched sticks, sealed parchment, printed paper, or electronic files. This book focuses, for the most part, on these primary documents of finance—financial instruments and contracts that have survived through history. Although the roots of finance undoubtedly extend into pre-

history, and many of the historical practices we study were part of a larger system that has only survived in pieces, these documents tell a remarkable story of invention.

The motivation for using primary documents is also, in part, a methodological one. Historians and economists both approach the past with a set of preconceptions that inevitably color their interpretations. Historians have long been aware of this retrospective bias in analysis and have either embraced it as part of the self-conscious process of writing history, or have sought to mitigate it through conceptual exercises. The former has led to history through personal association—for example, Simon Schama's beautiful narratives that begin with self-reflection, while a particularly intriguing example of the latter can be found in Niall Ferguson's *Virtual History*, which argues that the past has limited meaning without consideration of the counterpositive—the "what-if."[1] In the case of modern financial economics, the current mathematical models of financial markets and assets are so powerful that when we cast our attention back to history it is all too easy to recognize the modern security in the ancient contract. In doing so, it is also easy to ignore the social and historical context in which these tools came to be, a context that could help us understand, appreciate, and learn from the subtle distinctions that separate them from modern financial technology.

Thus, the use of original documents is a means for economists to focus on the primary text, to begin with an analysis of an object and to move outward from there to an interpretation and understanding of its relationship to historical and modern financial instruments and markets. This book is not meant to be a series of "just-so" stories about how stocks and bonds and options came to be, but a set of essays about episodes in the process of financial discovery. Understanding the process itself will ultimately prove more useful to financial market participants and analysts than charting the "birthdays" of modern financial assets. After all, given the rate of financial innovation today, such a study would soon be obsolete.

Elements of Financial Innovation

So what are these basic principles on which modern finance is based? We would argue that finance has three key foundations: the intertemporal transfer of value through time, the ability to contract on future outcomes, and the negotiability of claims. While there are a number of other important features of modern and historical finance, these are the essential elements that run as themes through the essays in this book. Put a financial engineer on a desert island (or an emerging market!) and give him only a few tools, such as the means to calculate the time value of money, the ability to contract on random outcomes, and a legal structure that allows the transferability of financial claims, and most of today's financial instruments could be reconstructed. Let us take a closer look at each of them.

Time Is Money

The simplest financial arrangement is an intertemporal value transfer—in plain language, a loan. This disarmingly simple contract has some remarkable properties. One person lends something to another with the promise that it will be repaid in the future. A borrower who comes to the arrangement without any money suddenly has wealth. On the other hand, the lender takes current wealth, places it in the contractual equivalent of a time machine, and transfers it to a future date, when he might better use it. For doing so, he is typically compensated with interest that makes him better off than in the present. In

chapter 1 Marc Van De Mieroop identifies written loan contracts from Mesopotamia that are more than 3,000 years old. Thus, the roots of finance can be traced back to the roots of civilization itself.

Civilization has long had an ambiguous attitude toward lending and interest. It is particularly ironic that usury laws in the Roman Catholic Church frowned upon the taking of interest during the thirteenth through eighteenth centuries in Europe—the period of greatest dynamism and invention in finance. Islamic *Sharia* still proscribes against lending, despite the fact that the mathematics of compound interest almost certainly entered Europe from the Middle East. Perhaps the clash of finance and religion is due to the seeming parallels between the term of a loan and the term of a life. The word "finance" in English comes from Old French, and shares a common root with the word "finish." It was used in the fourteenth century to imply a final settlement, and used most colorfully in Chaucer's *Lamentation of Mary Magdelene* who proclaims: "dethe is my Finaunce,"[2] a metaphor suggesting that life itself is a loan from God and death is the completion, or repayment. This similarity between life's course and a financial contract was apparently more than just a poetic conceit in medieval times. French theologians recognized the fundamental role played by time in financial contracting and used it to justify the Church's centuries-long ban on interest. According to William of Auxerre (ca. 1220) "The usurer acts contrary to natural law, for he 'sells time, which is common to all creatures.'"[3] Thus, for at least a millennium, finance has been viewed as an almost unnatural leap into the fourth dimension, a technology deemed so remarkable as to be contrary to divine plan. The underlying premise of this book is that something with such unholy power must be an important topic. Most of the financial innovations studied in this book have, as their basis, an intertemporal transfer of value.

Contingent Claims

The second foundation of finance is the ability to contract on future chance outcomes. This, coupled with intertemporal wealth transfer, is largely responsible throughout financial history for creative innovation. A contingent claim is nothing more than a bet, in which one side pays the other depending upon the outcome of some event. Life insurance is the classic example—the insurer pays the beneficiary when the insured party dies. Once the contractual framework for life insurance is established, however, there is no limit to the range of things that can be contracted upon. Homeowners can bet on whether or not their homes catch fire. Merchants can bet on whether a voyage is successful or not, investors can bet on whether the market goes up or down, chocolate manufacturers can bet on whether the price of cocoa is high or low. Like loan documents, the earliest written contingent contracts are Mesopotamian cuneiform records; however, some of the most exciting developments in contingent contracting took place in Holland in the seventeenth century with the creation of option contracts on shares—puts and calls that allowed speculators and hedgers to buy or sell stocks at a pre-specified price if they went up or down. In chapter 11, Oscar Gelderblom and Joost Jonker document the early development of these contingent financial claims in Amsterdam. The early Dutch options are the direct precursors to the worldwide derivatives markets of today.

The broader context of the development and analysis of insurance contracts and risk hedging demonstrates why contingent claims are fundamental to innovation. For example, in chapter 14 Robert Shiller writes about the invention of inflation-indexed securities in the early United States. Here, the value of a contract is contingent upon the price

of consumer goods—it thus becomes a tool for protecting consumers against the ravages of government's inflationary policies. It also provides a nice historical precursor to Professor Shiller's personal quest to stimulate the development of contingent contracts that would allow citizens all over the world to protect themselves against crashes in their national economies, inflation shocks, unemployment shocks, and even housing price declines.[4] These visionary contracts proposed by Professor Shiller are based on the principle that contingent claims can allow people to hedge themselves against the risk of an unknown future.

Contingent claims technology not only allows society to address immediate, foreseeable risks, but it also allows society to deal with the "meta-uncertainty" of an evolving future. What worries one generation about the future may not be what concerns the next. The principle of contingent claims is flexible enough to adapt to these changing concerns. As new risks appear, new insurance contracts are written to allow counterparties to limit and define their exposure. A modern example of this is Fannie Mae, the mortgage insurance agency. Fannie Mae issues bonds that are essentially repackaged monthly mortgage checks mailed in by U.S. homeowners. When interest rates change, Fannie Mae's business is dramatically affected. A rate drop brings mortgage refinancings and demand for new issuance. A rate increase causes the value of the bonds to decline. Fannie Mae hedges against interest rate fluctuations through the use of interest rate derivative contracts. In principle, these contracts will increase in value when the profits from the agency's underlying business decline, smoothing out the shock to the firm due to a change in the macroeconomy. This, in turn, keeps the agency operating. Years ago there was no Fannie Mae, no mortgage-backed securities market, and virtually no interest rate derivatives market. Now it is hard to imagine the U.S. economy and the U.S. household operating without them.

Chapter 19, written by Timothy Guinnane, is an in-depth study of one of the most innovative contingent contracts ever used in the context of modern international finance. The 1953 London Debt Agreement represented the final step in the restructuring of Germany's debt from the First World War, and used a contingent claim to solve a long-standing problem in European politics. By the mid-twentieth century, as a result of the Cold War, West Germany was effectively burdened with the obligations of the entirety of the nation's earlier war reparations. In recognition of the de facto split between East and West Germany, the international community limited the scale of these payments until such time as Germany was once again reunified. Securities were issued at that time which were truly "state-dependent"—that is, their value as bonds were conditional upon the structure of the modern German state. The fall of the Berlin Wall triggered a change in the loan terms, as envisioned for decades before by the negotiators in London. This contingent claim was, in a logical sense, the practical resolution to the long-term question of the German war debt posed so forcefully by John Maynard Keynes in *The Economic Consequences of the Peace*. It created terms by which Germany could finance industrial reconstruction and growth, and yet it did not necessitate debt forgiveness. As such, it allowed the German economy to develop vigorously following the Second World War, but without the all-or-nothing repudiation versus repayment framework that proved so economically disastrous in the 1920s.

What innovations in contingent claims will the current century bring? It is hard to tell, but the technology of derivatives will almost certainly allow future risks to be parsed, hedged, and traded, and may yet be used to address some of the most complex challenges of the evolving global financial architecture.

Negotiability

To borrow a phrase, negotiability does not make finance, it makes finance easier. Loans and contingent claims are certainly feasible without a secondary market, but the ability to trade contractual claims to a third party dramatically enhances the power of financial technology. Suppose, for example, that you have loaned someone $1,000 and will not get it back for a year. However, you suddenly need the cash. You could, of course, become a borrower yourself. Another possibility is for you to sell the loan contract to another person. In effect, to tell your borrower to repay the money to someone else. It saves the trouble of a second contract and effectively turns your first loan into money. Why? Because the person you sold the loan to could hold it himself to maturity, or can sell it himself in turn.

Negotiability is the defining characteristic of a capital market—it allows investors to transfer financial claims. A capital market like the modern New York Stock Exchange is an institution that brings together buyers and sellers to trade financial contracts. The power of such a market is that it simultaneously allows thousands, perhaps even millions of anonymous investors each day to rebalance their holdings of financial claims to suit the need for savings versus short-term cash use, as well as allowing them to speculate on or hedge against future events. As Richard Sylla, in chapter 17, and Ned Downing, in chapter 16, demonstrate, the liquidity of the NYSE was something that developed in response to historical forces and events. Its current preeminence was not preordained, but evolved along with the institutional framework of the U.S. financial, legal, and regulatory systems.

Can the framework be adopted without the institutional developmental process? The recent privatizations in Russia and China, and the dramatic emergence of equity markets in Moscow and Shanghai are a real-time test of this proposition. The near-collapse of the Russian equity market in the late 1990s and the tiny "float" of Russian equities compared to the size of the economy suggest that liquidity may result from process, not framework. Russia rewrote all the rules of the economy after the fall of Communism, and in so doing "shocked" society from one framework to another. In the new regulatory regime, the much hoped for liquidity of Russian shares is still elusive, although the active merger and acquisition market suggests that firm ownership—at some level—has become negotiable. In contrast, the gradualism and process-orientation of the Chinese experiment with capital markets has led to a huge volume of trade in Chinese shares, despite the fact that most companies are still majority state-owned. For both experiments the historical experience may provide some guidance.

While many of the financial innovations in this volume occurred in western Europe, true negotiability first developed in China and reached its most dramatic expression in the eleventh century in the form of paper money. Indeed, the Chinese not only invented paper money, they invented fiat money—that is, cash that is negotiable just because the government says so. Chapter 4, by Richard von Glahn, is the first truly comprehensive study of the development of paper money in China. In it, he not only documents the series of public and private sector innovations that evolved into fully negotiable paper bills serving as currency, but also highlights the military, social, and fiscal problems that led to this new financial technology. Paper money in China was an experiment that lasted for approximately four hundred years. Ironically, it disappeared in the fifteenth century, just as financial markets were developing in western Europe. In chapter 5, William Goetzmann and Elisabeth Köll focus on a specific Chinese document from the Song dynasty that represented a special form of paper claim to value—a type of early traveler's check

that co-existed with paper money of the era and demonstrates a richer financial context for the development of what we interpret now as currency.

Negotiability is a somewhat ambiguous term, because it can be used to describe everything from the legal transferability of a contract, to the existence of a "bearer" security—like a dollar bill. In these subtle differences, the ease of transfer can be important. Frictions and difficulties in trade sometimes cause markets to break down. They also can motivate important insights and invention. In chapter 15 Geert Rouwenhorst shows how the first mutual funds in Holland developed in part as a means of providing smaller investors access to financial securities that would otherwise be difficult to obtain. A striking example is the Russian government bond fund shares issued by Hope and Company in the early nineteenth century. Dutch investment bankers effectively created a market in Holland for Russian government debt by going to Moscow and subscribing directly to a set of loans, and then issuing loan-backed bonds themselves in Amsterdam. This saved investors from a similar trip halfway across the continent and consequently created an international market for Russian paper. These same bankers, incidentally, repackaged the early loans of the young United States as well. In both cases, they effectively turned cumbersome, illiquid financial contracts with governments into liquid instruments of smaller denomination that could be easily bought and sold in a capital market. Today, this process is called *securitization*. In this manner, nonnegotiable claims can be made negotiable through a repackaging process. The Fannie Mae example is again instructive. The process of packaging individual home mortgages into pools and selling the package as a bond has turned the U.S. mortgage market into a highly liquid set of negotiable securities that are bought and sold and held by investors all over the world. The ultimate beneficiary of some part of a personal mortgage check might be a retiree in London, a bond speculator in Greenwich, Connecticut, a university endowment in Florida, or even the homeowner—if the homeowner holds money in a bond mutual fund that in turn invests in mortgage-backed securities.

The financial architecture needed to create improvements in market liquidity depends as much upon individual insight and even fortuitous events as it does upon the forces of supply and demand that ensure its success. There are a few moments in financial history where it is possible to identify how a particular innovation came to be. In chapter 18 Niall Ferguson studies the birth of the first Eurobonds—loans issued in Europe's money center markets by countries promising to repay in a currency not their own. The Prussian loan underwritten in London in 1818 by the house of Rothschild, and the even more ambitious Russian loan floated in multiple European currencies by the Rothschilds in 1822, profoundly changed the nature of international relations. These sovereign debts demonstrated that liquidity was a transnational phenomenon—that government funding need not be constrained by borders—but the cost of such freedom was that obligations must be denominated in a coin of a different realm. This introduced a level of interlocking monetary dependency among European nations and their allies which arguably led to the global adoption of the gold standard decades later, as well as a redefinition of national power based upon the ability to tap global money markets for financing military adventures. As a historian, Ferguson focuses on the process by which this innovation came to be—the confluence of personalities, politics, and world events that led to a major innovation in the global financial architecture of the nineteenth century.

There are many other factors that make financial innovation possible; however, intertemporal transfer, contingent claims, and negotiability are the fundamental building blocks. Their interplay throughout financial history underpins all the essays in this vol-

ume. An equally important theme in this volume is the multicultural origins of finance. For most of us accustomed to thinking of modern corporate capitalism as a product of western Europe, the roots of finance in the ancient Near East, and its early development in China and central Asia, may come as a surprise. The broad scope of the work by the scholars in this book provides a chance to explore the development of finance from the widest possible perspective. The following pages are an overview of the development of finance, based on the essays in this volume.

Origins

The Old Babylonian loan tablets analyzed in chapter 1 are the earliest extant examples of financial instruments, but contracts themselves had a prehistory. Another scholar of the ancient Near East, Denise Schmandt-Besserat, has suggested that the origins of contracts might be found as early as 3000 B.C. in the form of clay balls, called *bullae*.[5] These fist-sized, hollow envelopes, common in Mesopotamian sites from the third millennium, contained small clay tokens that appear to represent some form of an economic agreement. Schmandt-Besserat argues that the tokens were tiny models of commodities: cloth, honey, bread, oil, sheep, goats, beer, milk, and even more abstract things such as days of work. She suggests that signs punched into the surface of the *bullae*, representing the tokens inside, evolved into the earliest cuneiform script. We will never know whether the *bullae* were the first "bonds" physically representing promises of future delivery of goods—but they could have been, and they reflect what was undoubtedly a culture that relied upon contracts and quantitative records.

An important parallel to the development of financial contracts was the mathematical capability of analyzing them. Babylonian mathematics was surprisingly sophisticated. It was based initially on a sexigesimal (base 60) system that made ratios and multiples easy to calculate and typically used linear interpolations to approximate such nonlinear phenomena as the motions of the planets and compound interest. Among the many mathematical texts that survive from the Old Babylonian period (1800–1600 B.C.) are study texts working out the solution to the accrual of interest. For example, a tablet in the Berlin Museum analyzed by the historian of science Otto Neugebauer asks how long it would take for a unit of silver to grow to 64 times its value if it doubled every five years—by any measure a long-term investment.[6] This corresponded to a 20 percent annual interest rate that only compounds every five years.

Although Old Babylonian mathematics allowed calculation of long-term loan values, Marc Van De Mieroop points out that most loans in ancient Mesopotamia were short-term advances to farmers allowing them to meet tax obligations. He argues that interest rates associated with these distress-related loans should not be regarded as annual rates, but interest due at time of harvest—regardless of the intervening time period. This is consistent with the notion that the technology for investment growth was based upon agricultural cycles. Wealth available at intermediate intervals could not be put to alternative productive use.

In chapter 3 Valerie Hansen and Ana Mata-Fink present some examples of similar "retail" loans in Han dynasty (206 B.C.–220 A.D.) China in the city of Chang-an—the eastern anchor of the Silk Road. While the interest rates to these pawnshop loans are not recorded, it is evident that the basics of small loans to individuals in China broadly resembled those of the ancient Near East. The Chinese loans they study suggest the widespread use of portable assets as loan security—an innovation in itself.

Financial contracts in China have a long history. Bronze vessels from the Zhou period (1027–221 B.C.) describe written land contracts that were divided between the two parties.[7] As early as the third century B.C. money-lending had become a road to riches. The most famous money-lender of the Warring States period (403–221 B.C.) was Lord Mengchang of Qi, whose annual income from lending was reported to be one hundred thousand strings of coin. The tale we have of him, recorded by the historian Sima Qian in the Han dynasty, describes exactly how his loans were collected and verified—and how he sometimes failed to collect.

> There was a man of Qi named Feng Xuan who was so poor he could not maintain himself. He sent a servant to ask that he himself be placed under Lord Mengchang. He wished to be lodged and fed as one of the lord's retainers. . . . Later Lord Mengchang put out a request among his retainers asking which of them could keep records, and thus was able to collect his debts in Bi. Feng Xuan said that he could do so. . . . Thereupon Feng secured a chariot, and rode off carrying the tallies of indebtedness. . . . Feng hurried to Bi, where he had the clerks assemble all those people who owed debts, so that his tallies might be matched against theirs. When the tallies had been matched, Feng brought forth a false order to forgive those debts, and so he burned the tallies. The people all cheered.[8]

The grand historian's account suggests that, regardless of whether lending actually began in the ancient Near East or whether we just think it did because clay tablets survive in the archaeological record, it appears that by two thousand years ago the practice of lending and indebtedness extended from Rome to China. In fact, in Rome, not only was banking and debt finance practiced, but Ulrike Malmendier argues in chapter 2 that Rome effectively had an active equity market, in which shares of organizations called *societas publicanorum* were negotiable, or at least transferable as a result of public auction in the Roman forum.

Continental Polarities

If loans first appeared in the Middle East and fully negotiable paper instruments appeared first in Song dynasty China, why is modern capitalism overwhelmingly associated with western Europe? Why, for example, didn't capital markets in Shanghai and Guangdong—instead of London and Amsterdam—finance the development of international trading companies and related colonial expansion? This question has been posed many times in many ways—most often it is termed the Needham Question, after Joseph Needham, author of the multivolume *Science and Civilization* in China, which documents in extraordinary detail the level of scientific advancement in Chinese history. More recently, Kenneth Pommeranz has termed it *The Great Divergence* and argued that geographical determinism is the answer to the puzzle. A striking feature that emerges from the essays in this volume is a clearly identifiable point of financial divergence between East and West.

That salient period was the twelfth and thirteenth centuries, when both China and Europe were engaged in large-scale warfare. Song China at the time was fighting an exhausting and all-encompassing battle against central Asian invaders all along her northern frontier. China lost her northern capital to invaders in 1127 A.D. but the armies of the Southern Song battled on until the Mongols finally defeated them in 1279 A.D., founding the Yuan dynasty. As chapter 4 demonstrates, this crisis was the catalyst for the invention

of inflation financing. When the Mongols seized power, they also adopted China's fiscal structure, and they, in their turn, drove down the value of paper money through inflationary policies. The Ming dynasty (1368–1644 A.D.) followed suit, putting a virtual end to the use of paper money in China until the modern era.

In Europe, the Crusades became a catalyst for a different sort of wartime finance. In Chapter 8 Luciano Pezzolo focuses on the origins and development of liquid bond markets in the early Italian republics in the twelfth and thirteenth centuries, and the contrasting role that the bond markets played in the political fortunes of rival city-states in the Italian Renaissance. He points out that in 1171 Venice levied a forced loan on her wealthy citizens to finance the construction of a fleet against the Byzantine emperor. The loan was necessary because Venice had neither the financial resources to construct the war fleet nor a paper currency it could inflate. Over the next century, while China was fighting Mongols and issuing paper money, Venice and her rival city-states continued to refine the process of debt issuance. In fact, the city-states found that, properly structured, there was actually a demand for governmental loans as investment vehicles. European governments thus figured out how to turn a fundamental economic need to their advantage while China's government did not, although it may be argued that China used paper money as an instrument of monetary policy as well as simply a tool of wartime finance. Europe eventually discovered paper money and inflation financing, and China learned how to float loans; however, their respective financial technologies in the late Middle Ages may have created conditions which sustained an institutional separation between two highly civilized societies for centuries.

Some of the earliest financial tools used by Western governments were perpetuities—bonds that pay interest forever and never return the principal. In effect, perpetuities exchange a finite amount of cash for an infinite future flow. In chapter 10 William Goetzmann and Geert Rouwenhorst explain in detail just how these perpetual European borrowings worked and describe a still-surviving perpetuity from the Dutch Age of Reason—an instrument that has been paying interest since the mid-seventeenth century. This particular bond was issued in 1648 to finance the repair of a section of the dyke containing the river Lek, near the city of Utrecht. The buyer of the bond was promised by the issuer—a quasi-governmental water authority—a stream of fixed payments that would last forever, presumably matching the permanent future benefits that the dyke represented to the citizens of Utrecht. While preparing the chapter, Rouwenhorst collected the current and back coupons for the bond, an act that represents a modern, living connection with the origins of European finance. The obligation was paid by the modern descendent of the seventeenth century authority established in Holland to build and repair the same dyke.

China had its own great infrastructure projects, some of which virtually dwarfed the Dutch dykes and land reclamation initiatives. Construction of the Great Wall began in the third century B.C., and the Sui dynasty saw the completion of a great inland waterway linking China's two largest river systems. Despite the massive financing demands of such projects, there is little evidence that China developed an analogous structural system of government debt financing. This is not because China lacked a history of lending or of legal certification of financial claims. Indeed, as chapter 3 indicates, China not only possessed a sophisticated mercantile court system but also an early securitized retail lending tradition based upon pawnshops. However, the twelfth century seems to have been a fork in the road for finance, and Europe learned first how to exploit the dimension of time.

Chapter 7 examines the role of mathematical knowledge in the growth of European

capitalism by looking at the work of Fibonacci of Pisa. Fibonacci was a financial advisor to the Pisan government and an educator. As an early financial analyst he developed a mathematical framework for evaluating the complexities of different financial contracts—in particular, he devised an early form of the modern present value criterion. Fibonacci's mathematics of money became the foundation for later developments in western European finance.

It is remarkable how mathematically sophisticated this technology eventually became. In chapter 12 James Poterba traces the development of annuity contracts in early modern Europe. Annuities, like bonds, are promises of future cash flows but with a key difference. Standard annuities kept paying for the life of the beneficiary but would stop or change upon death. Thus, a simple present value criterion was not sufficient to calculate the economic cost of an annuity. This dependency in value upon the human lifespan challenged the greatest mathematical minds of the seventeenth and eighteenth centuries, including Jan de Witt, Edmund Halley, Abraham de Moivre, and Nicholas Bernoulli. Indeed, the problem of annuity valuation contributed significantly to the development of the mathematics of probability—still a key tool used by modern financial engineers.

While China absorbed mathematical knowledge from the West, at least from the seventeenth century onward, when Jesuit Matteo Ricci began to translate mathematical classics into Chinese, the economic context for Western financial mathematics was lacking in China. Western market forces drove the quest for valuation of financial instruments like perpetuities and annuities, and the development of probability methods, accounting practices, and discounting. These, in turn, led to further developments in financial instruments and markets. Although the basics of finance and financial analysis were present in China before the late nineteenth century, the same dynamic relationship between mathematical knowledge and market innovation that characterized European markets was not.

Whether the divergence between East and West explains, or is explained by, cultural, geographical, or even mathematical factors is open to speculation. However, the historical divergence is important to study and understand in its own right. It suggests that the history of finance cannot focus on the singular strand that led to Western corporate capitalism. The story of financial technology in China would seem to imply that there are multiple, plausible evolutionary paths for economic systems. The differences in development between East and West suggest that Western capitalist economies were not the inevitable product, or the sole equilibrium outcome, of a set of common factors. It is worth considering whether the current financial architecture may simply have been due to the accident of history. If the last millennium of history were rewound, government bond markets might have developed in China and the Venetians might have invented inflation. Any economic or social theories that purport to explain the development of financial instruments and markets also should be robust enough to explain their failure to evolve in the rich social, economic, and intellectual context of Song China.

If capitalism is the confluence of fortuitous social, economic, and intellectual events over the past few centuries, then we should consider two troubling implications. The first is that we may not know how to re-create it. Given the serious attempts to develop capital markets underway in Russia and China, it would be useful to know whether capitalism is "path-dependent." Will it work without the evolutionary process that brought it to fruition in Europe and North America over centuries, or will Russia and China be forced to perpetually exist as emerging markets on the periphery of the world's core capital markets? Can capitalism re-create itself, or must it continually expand from its legal and economic core?

The second implication of a "capitalism as an accident of history" interpretation is that the system may not be as robust as it now appears. Our view of history, when confined solely to the roots of capitalism and the current financial system, may be colored by our trajectory of success. A broader historical look at the world economy and its experimentation with financial instruments and markets reveals that continued linear development of markets is not inevitable.

Corporations as Financial Innovations

One could argue that corporate capitalism was the defining economic institution of the twentieth century. Its widespread growth in the early part of the century culminated in the first great age of globalization—a fluorescence of markets, enterprise, infrastructure, and modernization that touched virtually every corner of the world. By midcentury, however, the social and political backlash against the juggernaut of capitalism had divided the world in half, created the context for a Cold War, and polarized the popular visions of corporations—as either the solution to all problems or the source of all evil. Given the corporation's central role in modern world history, no volume on financial history would be complete without consideration of this entity.

The corporate form is a financial innovation in one key respect. It is an entity that is not human. That is, it has legal standing in many respects like that of an individual, with rights of ownership and the capacity to contract with others, and yet it is really a fiction—a useful trope that turns an association of people into a business unit. How corporations evolved as legal entities is one of the most fascinating and long-standing questions in legal history and one of the essays in this volume makes an important contribution to this question.

In chapter 2 Ulrike Malmendier, a financial economist and legal scholar, brings a combination of these two perspectives to her analysis of the evidence for the existence of corporations in the Roman Republic. These companies are known through extant documents describing their performance of service to the state, including revenue collection, public works, and military procurement. Although entities like *societas publicanorum* may have existed to do nonstate business, most extant records characterize them, in effect, as state leaseholders. Malmendier argues that the *societas publicanorum* had the essential feature of the corporation—that is, legal standing as an entity, equivalent to that of a natural persona. In addition, shares (*partes*) in these firms were widely held by Roman investors and they traded regularly in the public marketplace. Thus, by the second century B.C., Rome had developed some form of equity finance that resembles the modern equity-share corporation.

With the fall of the Republic, the emperors nationalized many of the functions performed by the *societas publicanorum* and they disappeared from the documentary record. Did the basic structure of these companies persist in the European economy through the Dark Ages? Or was the technology of share capitalism lost and then reinvented a millennium and a half later? Without historical records it is difficult to do more than speculate about whether the corporate form is something that survived or was rediscovered in Europe. This is of more than academic interest, because it is important to understand whether a technology like the corporation needs to be passed along or diffused through culture, or whether it arises naturally as an equilibrium solution to an economic problem. Given sufficient freedom for development in an emerging market, will economic nature take its course, or does that market need a transfer of corporate "genetic code"?

Two chapters address a key episode in the early development of the first modern corporation—the Dutch East India Company, *Verenigde Oostindische Compagnie* or VOC. A major financial innovation introduced with the VOC was limiting the liability of shareholders. No matter how large the loss incurred by the company, its shareholders would be liable for no more than the value of their initial investment. In chapter 9 Larry Neal points out that the concept and basic structure of the first modern corporation lay in earlier Dutch practices of selling shares for single maritime ventures, and that the early history of the firm was the story of an evolution from the temporary venture structure into a permanent institution. Neal embeds the account of the VOC in the context of the market for trading its shares on an exchange. By the date of the firm's founding in 1602, securities markets in Europe had already existed for centuries. In Holland, in particular, there was a widespread market for rentes and similar municipal debt instruments, and this market extended beyond the monied classes to the trade and professional classes. Thus, a market context already existed for the active trading of shares and debt in a private entity.

Chapter 11 focuses on the development of the derivatives markets in Holland at this time. The authors show that, from the very beginning of trade in VOC shares, there were demands by investors to hedge against the risk in the fluctuations in share value, as well as demands for more sophisticated "side bets" on company share prices. They document evidence, for example, of forward contracting on VOC shares within a decade of their first appearance, and argue that there are earlier European precedents for these contingent claims. Viewed in the context of financial practice at the time of its appearance, the Dutch East India Company and the public market for its shares was an important innovation, but perhaps not a radical one. It grew out of the public demand for investments and the pre-existence of a market medium.

The great import of the Dutch East India Company lies in the novel mechanism it offered for financing the exploration and commercial expansion of European business ventures around the globe. Chapter 9 quantifies the extraordinary financial payoff to investors in the VOC over its lifetime, and this as much as anything else must have motivated imitators. In the century and a half after the founding of the Dutch East India Company, similar share-financed trading companies appeared in England, France, Belgium, Holland, Russia, Sweden, Italy, and Portugal. These companies envisioned vast profits in the exploitation of trade routes to Africa, Asia, and the Americas and the establishment of valuable settlements in all of these far-flung regions that would allow the acquisition or agricultural development of commodities in demand by European markets. In the founding of the VOC lay the seeds of European colonial empires that would remake the globe over the next three centuries and become the catalyst for some of the greatest, as well as some of the most notorious, distinctions of capitalism.

The *Compagnie de l'Occident*—more popularly known as the Mississippi Company—was founded in 1717 to settle and exploit the vast Louisiana territory owned by France. The company's founder, John Law, a Scottish-born banker and advisor to the French crown, had an even grander vision for the company. It became one of a set of private corporations created by the financier to revive the French economy and deliver it from its overwhelming indebtedness. Within a few short years, Law's company would demonstrate to the world how corporate structures and their securities could be used to revolutionize government finance. Chapter 13, by Antoin Murphy, focuses on John Law as a theorist who sought to put into practice a scheme to rescue France from financial collapse through the creation of an interlocking set of corporations that collected her taxes, man-

aged her colonies, and rationalized her currency. Law's radical vision exceeds any financial scheme proposed since, and it came close to success. Its downfall was due in part to a failure to control this new money supply, and a collapse in confidence in the new corporate entity. The resulting crash of 1720 is often regarded as the bursting of the world's first stock market bubble. In the now-fashionable environment of criticism of stock market excess, Law's brilliance as a financial engineer, and his intention to use innovative financial architecture to solve real economic problems, are often overlooked. Murphy points out that before the crash, Law's scheme managed to revive the real economy of France and even after the crash, it had the potential to become a permanent solution to her fiscal problems. Thus, Law is not the villain as he has been portrayed in widely read books such as Charles Mackay's *Extraordinary Popular Delusions and the Madness of Crowds*, in which the Scotsman plays a large role as willing instigator of stock market speculations and frenzies. His scheme is a historical foray into the potential of corporate finance to address the large-scale macroeconomic problems of society. Rather than hold Law up as an example of failure, his plans for creating equity ownership in government perhaps should be studied a bit more carefully.

There is a real villain in our volume, however—King Leopold of Belgium, a rapacious capitalist who took corporate finance to its most extreme, inhumane boundaries. In chapter 20 Robert Harms tells the story of how the monarch turned the Congo into a privately held corporation, outside of the legal and geographical boundaries of any organized state. For decades, until it was acquired by Belgium at great expense from the king, the Congo served only the financial whim of its owner. Harms explains how Leopold sold off concessions for the exploitation of the Congo basin to firms that eagerly and mercilessly extracted ivory and then rubber from its native inhabitants. As these resources diminished, managers employed legendarily cruel tactics to motivate workers, including mutilation and infanticide. As Harms points out, Leopold paid for the initial development of the Congo through the age-old method of corporate finance—the issuance of debt. The tale of Leopold's bonds and the corporate roots of the Independent State of the Congo are important parts of the story of corporate financial innovation. Markets are powerful but amoral. The invisible hand steers them toward efficient but not necessarily humane outcomes. In the case of Leopold, it took a combination of bold investigative journalism and the world's first campaign for corporate responsibility to wrest control of the Congo from the king. The message perhaps is that financial innovation has the power to solve large-scale economic problems but needs to be used wisely—or at least transparently. Today, we find ourselves once again in a period of globalization of the world's markets, but one with a fundamentally different financial architecture. Despite the existence of a modern set of international financial institutions such as the International Monetary Fund and the World Bank, it is worth reflecting occasionally on the past failures and excesses in world financial history.

This volume is by no means a comprehensive history of financial innovation. Its goal is considerably more modest. It represents the reflection and analysis by a number of scholars on particular episodes in financial history. There are important benefits to the episodic nature of this volume, however. Given the underdeveloped nature of the field of financial history, its scholarship is arguably still in the dominant mode of data collection and a search for meaningful developmental models rather than in a period of synthetic interpretation. While a few comprehensive studies in the field stand out—most notably works such as *A History of Interest Rates*, by Sidney Homer and Richard Sylla, and *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason*, by Larry Neal, the

great excitement of our discipline lies in the process of investigation and discovery. Our hope is that this volume will create a framework for future study and interpretation of financial innovations through history, and a wider recognition that history has a lot to teach us about the modern processes of financial development.

New Haven, 2004

1

The Invention of Interest

Sumerian Loans

MARC VAN DE MIEROOP

The first literate culture in world history originated in the southernmost part of modern Iraq, the region usually called southern Mesopotamia or Babylonia when its ancient history is discussed. After a long evolution starting in the fifth millennium B.C., when people first developed irrigation agriculture enabling them to settle year-round, true cities grew up in the late fourth millennium, around the year 3200. Relatively large populations—their exact size is hard to estimate but they must have amounted to tens of thousands in each case—came to reside together in the same places. Such dense concentrations of people required the control of the surrounding agricultural land in order to guarantee food supplies. In southern Iraq ecological niches with different resources adjoin one another: fertile agricultural fields irrigated by nearby rivers, large grazing areas in the steppe, and rich fishing grounds in the marshes. In order to increase productivity, people became specialized in their labor (farming, herding, fishing), while in the urban centers professional groups emerged that did not engage in food production at all but worked purely in crafts manufacture and the like. The loss of economic self-sufficiency meant families needed to exchange products. In this world of exchange two indispensable elements developed: writing and credit. The administration of exchange on this scale required a flexible recording system, and together with the birth of cities in Babylonia a full-scale

writing system was invented. The script used is today called cuneiform, "wedge-writing," because of the wedge shape of the characters impressed on clay tablets. The language of the earliest documents likely was Sumerian, which for fifteen hundred years remained the dominant language of administration in the region, although the inhabitants spoke a variety of other languages as well. Since the exchange system came to rely on obligatory contributions that could not always be paid on time primarily because of agricultural shortfalls, credit mechanisms also evolved. The existence of written records allows the historian to study the Babylonian economy in depth. The existence of a credit system led to the development of interest. We are thus in a position to investigate the earliest appearance of this financial arrangement, which has been with us ever since. In this chapter I will discuss aspects of financial interest based on materials from the period of about 3200 to 1600 B.C. as they were found in southern Mesopotamia. Naturally, later evidence from that region exists as well, but this chapter is not a history of interest, only an elucidation of its earliest appearance.

The Economic Background

The organized exchange of agricultural and manufactured products and services was at first centered in the temple, and religious structures are the earliest monumental buildings in Babylonian cities. In addition to an organizational staff and a physical place for storage, the temple provided an ideological basis for the exchange of goods: the city god housed in the temple received the varied contributions from the institutional community and distributed goods in return. Over the first half of the third millennium the palace usurped the centrality of the temple in this redistributive system. Its power was based on prominence in military matters. The concept of redistribution through a central organization did not disappear, however, and throughout the third millennium most of the urban population was dependent on some central organization for its basic needs. The ration system existed as a fundamental characteristic of the Mesopotamian economy for this entire period. It is best documented under the twenty-first century Babylonian Ur III dynasty, when the palace played the central role. The basis of the ration was barley; issued monthly in set amounts, the quantity was determined by the worker's gender, age, and position in the hierarchy. For instance, a basic barley ration for an adult man was sixty liters a month, for a woman thirty liters. Intermittently, people were provided with oil and cloth. The preserved ration lists indicate that individuals from high officials to the babies of manual laborers received such allotments.[1] While other exchange mechanisms existed alongside the redistributive one, the latter was of crucial economic importance.

To make such distributions possible, assets were required and, logically, people had to donate part of their production to the central institution. So the contributions became mandatory and credit became a necessity. When the farmers, fishermen, or others were unable to pay up they had two options: they could either remain in arrears to the institution or borrow from someone who had sufficient capital at hand. Both cases were portrayed as loans; whatever was owed was considered to have been loaned to the debtor. Being in arrears was probably a common occurrence and the earliest evidence of debts, from the twenty-fifth century, falls in this category. The oldest records available derive from an institutional background. Their formulary is concise and open to interpretation. It seems likely, however, that the first records of credit transactions are lists registering the names of people and the amounts of barley they owed. Ten of these lists are preserved and they date to the first decades of the twenty-fourth century.[2] For example:

Account rations tablet from the Ur III period. Fired clay with cuneiform inscription. Example of an account of rations issued to male and female workers. Obverse (left) and reverse (right) of the tablet.

*Liters barley	864	Lugid, the man of the levy
	720	Kidu, the man from Bagara
	720	Igizi, the blacksmith
	720	Engarzi, from the libation place
	720	Ur-Hamazida, the plowman
	720	Ur-dumu, from Ashdu
	720	U'u, the doorman from KA.KA
	720	Lugalnig
	720	Almu. These are servants from within the estate
	720	Eki, he is a priest
	720	Kikuli, the shepherd
	720	A'edene, from the field of the temple of Dumuzi
	720	Anini, the overseer of Salla
	720	Amarezem, from Kishutaga
	9,360	Gugish, the overseer of servants.
Total liter barley	19,584	Amarezem of Urnu gave as obligations.[3]

The crucial term is the last word in the translation, which renders the Sumerian word ur_5. In later centuries this became the generic term for "loan," but it is not certain that in the twenty-fourth century it had the same meaning and connotations. Frequently in Mesopotamian financial history the meaning of terms shifted over time. The account above seems to record the obligations of fifteen men, and until they had delivered the barley they were in debt to the organization that created the record. This type

* The translations of the ancient texts are my own, unless explicitly stated. Information added to clarify the text is given between < >, explanatory remarks between ( ), and restorations of broken passages between [ ].

of account soon appeared wherever institutional archives were maintained, including outside Babylonia in the west of Syria,[4] and amounts of silver became registered in this way as well.[5]

At the same time, people who were temporarily in need could turn to others for short-term loans. This situation more closely resembles the idea of a loan as we define it today: a borrower receives an amount of silver or goods and promises to repay it in the future. The earliest evidence of such arrangements also comes from the twenty-fourth century but the records are difficult to interpret because their formulation is vague to us and the circumstances of the transaction remain obscure. Moreover, they are not dated, so it is impossible to determine what preserved document is the earliest. This record, dated to the mid-twenty-fourth century, is certainly one of the earliest examples, however:

> 40 grams silver and 900(?) liters barley, Ur-garima holds over Puzur-Eshtar.[6]

The document indicates that Puzur-Eshtar owed silver and barley to Ur-garima. We do not know why he borrowed, the nature of the relationship between the two men, nor their status in society. Ur-garima could have represented an institution, and the amounts of silver and barley listed could have been arrears of payments due by Puzur-Eshtar. But this could also be a credit agreement between two individuals acting privately.

These two situations of debt—an arrears in payment and an outright loan to take care of an emergency—became more intertwined as time passed due to the institutions' increased use of middlemen to manage their external affairs. Especially in the second millennium, it became very common for institutions to rent out the collection of contributions to private entrepreneurs who kept some of the income, like taxfarmers. The same men also converted the payments, made in perishable goods, into silver, which was more useful to the central institutions. The middlemen's access to silver also enabled them to advance amounts to whoever needed it for institutional obligations. These borrowers included long-distance traders who required capital for their business, but more often they were individuals who simply needed short-term financial help. The majority of debts were incurred for basic survival. A shortfall in the harvest, for example, necessitated a loan to tide a farmer over late in the agricultural year. Special expenditures, such as bridal gifts, also forced some to take out loans. Men, and some women, with access to disposable wealth handed out small loans, made advances for people who could not pay their rental fees, and in various other ways became creditors.

The practice of making loans to individuals at times got out of hand, a problem best illustrated by the issuance of royal decrees annulling debts. Those are best attested in the seventeenth century, but references to "establishing order in the land," the Babylonian expression to indicate a debt annulment, appeared as early as the twenty-fourth century.[7] The king abolished all debts forced on people due to a lack of funds, but loans taken out by merchants for trade purposes were not affected. Debt slaves were released. Moreover, when a piece of property—a home, for example—had been pledged, it was also returned to the original owner. For years after such edicts the courts were forced to decide whether or not property had been transferred because of a debt, since the property did not need to be returned if the sale had been voluntary. The prevalence of credit transactions thus also affected the legal system, and in the first centuries of the second millennium the loan contract was the most common record of the Babylonian textual corpus.

Silver loan contract tablet case. Fired clay with cuneiform inscription. Ca. 1820 B.C. Obverse (left) and reverse (right) of the tablet case. The text records the loan of 9.33 grams of silver to Nabi-ilishu from the god Shamash and Sin-tajjar. The tablet stipulates that the loan will be repaid at harvest time with interest.

Babylonian Loan Contracts

There is enormous variety in the formulation of loan records but the indispensable elements include what was borrowed, by whom, and from whom. Regularly, how and when it had to be repaid was also indicated. Babylonian contracts were almost always dated, often to the day, so we know when the transactions took place. Since many loans were an arrangement between two individuals, there were witnesses whose names were listed as well. Some examples will illustrate the variety of formats.

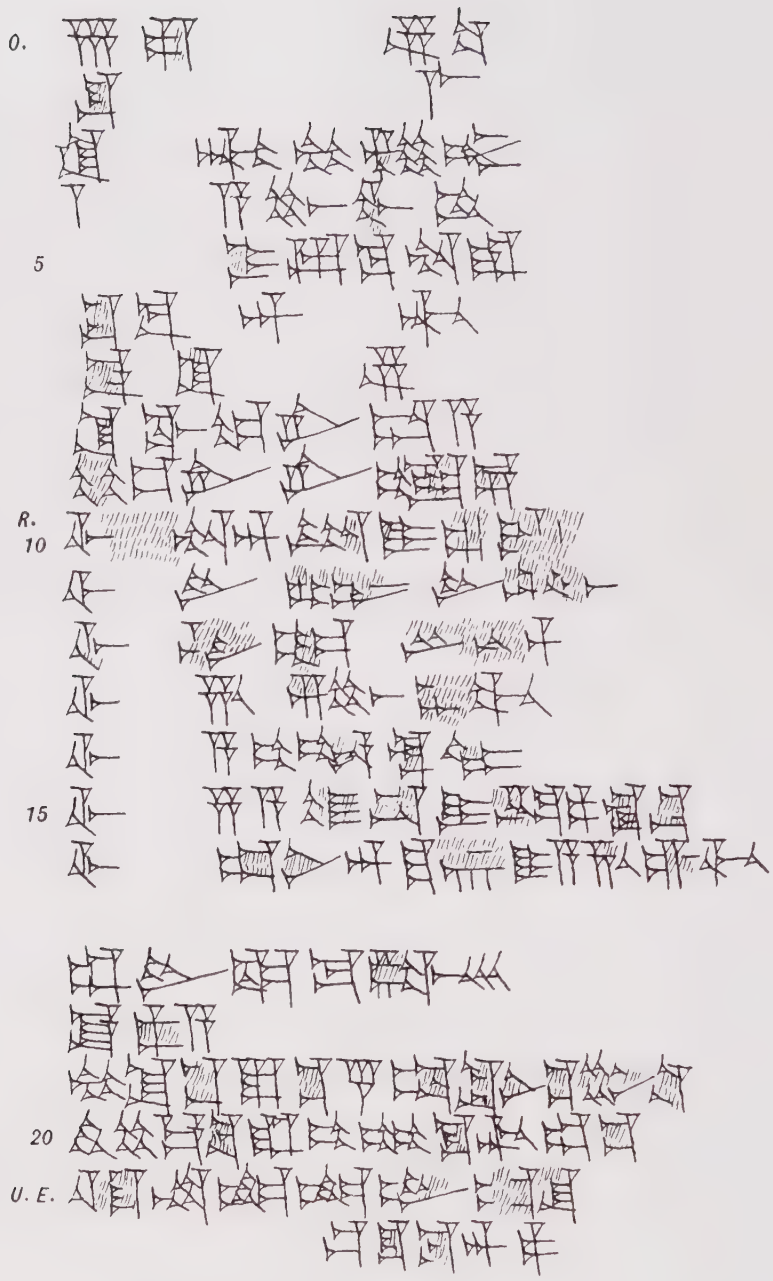
This silver loan, to be repaid with interest in silver, dates to the seventh month of the year 1820 B.C.[8]:

> One and one-sixth shekels silver (i.e., 9.33 grams), to which the standard interest is to be added, Ilshu-bani, the son of Nabi-ilishu, received from (the god) Shamash and from Sin-tajjar. At harvest time he will repay the silver and the interest. Before five witnesses (their names are listed). In month seven of the year that Apil-Sin built the temple of Inanna of Elip.[9]

This is a straightforward advance of silver to be repaid with an unspecified interest at harvest time. No information was given about the purpose of the loan because this was unimportant to the creditor. Sin-tajjar kept the contract as proof that Ilshu-bani owed him something, and the witnesses guaranteed that the exchange had taken place.

That certain silver loans were to be repaid with another commodity is clear from this tablet dated to the eleventh month of the year 1809:

> Six shekels (i.e., 48 grams) silver as a šu-lá loan, Abuwaqar, the son of Ipqu-Erra, received from Balmunamhe. In the sixth month he will repay it with sesame according to the going rate. Before seven witnesses (their names are listed). These are the witnesses to the seal. In month eleven of the year when <king Rim-Sin>



defeated the armies of Uruk, Isin, Babylon, Rapiqum and Sutium, and Irdanene, king of Uruk.[10]

Silver loan contract, hand copy. 1809 B.C. A loan of silver to be repaid in a commodity (sesame) in seven months. The tablet is reproduced here in a hand-copy, which is the usual way in which cuneiform tablets are published.

This contract most likely indicates that Abuwaqar was paid seven months in advance for a delivery of sesame to Balmunamhe. The amount of sesame would be determined by the rate of equivalence between silver and sesame at the time of delivery. The agreement was formulated as a loan, and the contract identified it with the Sumerian term šu-lá. While this term is not fully understood, its primary use was to indicate an arrangement under which goods were paid for in advance of delivery.[11] Many other contract formats are at-

A contract for future delivery. Fired clay with cuneiform inscription. Nineteenth century B.C. Record of a promise to deliver wooden objects and silver in the future. Obverse and reverse of the inscribed tablet case. Several seal impressions on the surface served as signatures.

tested and clearly result from a multiplicity of arrangements expressed as loans. In essence, any financial obligation that needed to be fulfilled in the future was considered to be a loan. A promise to deliver wooden objects at a certain point in the future, for example, was phrased as a loan:

> Thirty wooden [xxx], ten of 3.5 meters each, twenty of 4 meters each, in the month Magrattum Akshak-shemi will give to Damqanum. Before six witnesses (their names are listed). The year that the golden throne of Sin of Warhum was made.[12]

Because of the nature of the loan contract as a document attesting that something was owed, it could be passed on from the original creditor to another person. We observe this in a few cases when repayment to a different party is explicitly documented,[13] and when a loan record is found in the archive of someone not mentioned in the text at all. The loan contract thus acted like a letter of credit, although there is no indication that loan contracts were commonly traded or sold.

It is important to keep in mind that almost all the available loan documents from this period are the evidence of unmet obligations. The creditor kept the contract until the obligation was settled, at which time the document was destroyed because it had become meaningless. Usually the tablet was soaked in water so the clay could be reused, but sometimes a line was scratched over its surface. The abundance of remaining tablets are thus only a fraction of those once written.

Interest

The loan contract routinely called for an interest payment, introducing a complex element into the agreement. The idea of repaying more than one borrowed is not self-evident and

has often been criticized as unnatural in world history. Aristotle in the fourth century B.C. attacked interest as follows:

> The most hated sort [of wealth], and with the greatest reason, is usury, which makes a gain out of money itself, and not from the natural object of it. For money was intended to be used in exchange, but not to increase at interest. And this term interest, which means the birth of money from money, is applied to the breeding of money because the offspring resembles the parent. That is why of all modes of getting wealth this is the most unnatural.[14]

Later literature abounds with portraits of those who charge interest as evil; but the textual records of Babylonia reveal the development of interest on loans and its fundamental concepts. The Sumerian word for interest was "máš," a term also used to indicate a lamb. While this dual usage may have been a mere coincidence, a logical connection between the two meanings can be established. In the agricultural system of Iraq, in the distant past as well as in modern times, a tenant could graze animals on the fields he rented. As his herd expanded, partly because of the landlord's investment in the land (especially when the latter provided water for irrigation), this increase was taxed and the tenant had to hand over a small number of lambs. Similarly, an advance of silver or barley could be considered as the productive use of that capital, for which the creditor charged a fee, to be paid when the advance was returned. Interest thus originally resembled a grazing fee,[15] which was due because of the growth of a herd, to be paid with lambs.

A remarkable aspect of interest rates throughout Mesopotamian history was their constancy when officially stated. From the early second millennium a number of royal decrees exist that always proclaim a 20 percent interest rate for silver loans, and a 33.33 per cent rate for barley loans. The Laws of Eshnunna, from the early eighteenth century, state in a concise way:

> Per 1 shekel <of silver> (180 barleycorns) will accrue an interest of 36 barleycorns (i.e., 20 percent); per 300 silas <of grain> will accrue an interest of 100 silas (i.e., 33.33 percent).[16]

The famous stela inscribed with the Code of Hammurabi, dated to the mid-eighteenth century, is damaged in the part that contains the paragraphs relating to interest. We can reconstruct the text, however, from a contemporary clay tablet, though it is not well preserved and the lines are somewhat muddled. The relevant paragraph can be translated as follows:

> If a merchant gives grain or silver an interest-bearing loan: per kur (300 silas) of grain he shall take 100 silas as interest (i.e., 33.33 percent); if he gives silver as an interest-bearing loan: per shekel (180 barleycorns) of silver he shall take 36 barleycorns as interest (i.e., 20 percent).[17]

Actual contracts from the early second millennium express the same idea as well. Some barley loans state that "he shall add as interest 100 silas per kur."[18] Silver loans use various formulae to indicate that 20 percent of interest is to be added,[19] such as "an interest of 12 shekels per mina is to be added." More than a thousand years later, the same formulation can still be found in Babylonian contracts of silver loans. They often state, "Every month, one shekel of silver will be added to one mina (60 shekels)," arriving thus at a 20 percent rate after twelve months.[20]

The code of Hammurabi. Inscribed black basalt. Mid-eighteenth century B.C. The stone stele recording Hammurabi's code is in the Louvre museum. The figures at the top represent the ruler and a deity. The text contains a number of references regulating loans and interest rates.

These figures were not arbitrary, and, as is clear from their permanence, were not set by forces of supply and demand. In the case of silver they result from the systems of measuring weight and time. In Mesopotamia's sexagesimal system of weight measures, the mina and the shekel were two basic units, the former sixty times larger than the latter. For both measures a single vertical wedge 𒁹 indicated the number one. The value of the wedge was thus only clear when succeeded by the term mina or shekel. Since interest was related to the growth of a small lamb from an adult sheep, it was easy to see a parallel of the larger mina giving birth to a smaller shekel. As the Babylonian year was usually made up of twelve months, the monthly addition of one smaller unit, the shekel, to the higher ranked unit, the mina, led to an annualized increase of 20 percent.[21] In the case of barley the interest rate was higher, namely, one-third of the borrowed amount. That rate may have been derived from the rental fee on the use of a field for farming,[22] which often was set at a third of the yield,[23] but this remains uncertain. Of course we need not seek for economic reasons to explain interest rates then.

It is unclear why silver and barley loans would have been issued at different rates of interest. Some scholars have suggested that this was due to fluctuations in the market price of barley. Most barley loans were taken out shortly before the harvest, when prices were high, and repaid after the harvest, when prices were lower. An investor, who could have given a loan of silver rather than of barley, would want compensation for the loss of value of the barley. Instead of merely asking for a 20 percent increase in the amount to be repaid, he added another 10.33 percent. That extra amount of barley would make up for the fact that one liter was worth less at the time of repayment than when it was originally issued as a loan.[24] This "modernist" interpretation—using contemporary concepts in the explanation of the ancient economy—is based on the belief that market forces influenced credit. Matters are not that simple, however. If commodity prices indeed affected interest rates, would we not see greater variation, as barley prices were not constant from year to year? Moreover, in practice the rates of interest did not always adhere to the principles stated by the kings. For example, in southern Babylonia from the mid-nineteenth century on, barley loans had a customary interest of only 20 percent, while those in the north stayed at 33.33 percent.[25] It seems more likely, then, that the rates of barley and silver varied as a result of custom rather than of economic factors, such as the price of certain commodities. Similarly, we still adhere to certain customary fees: a litigation lawyer receives one-third of the award, a real estate agent 6 percent of the sale price, and so on.

The importance of the officially stated rates can be seen in practice; when interest is stated it often adheres to the customary 20 percent for silver or 33.33 percent for barley. The latter did, however, go down to 20 percent in southern Babylonia after the mid-nineteenth century.[26] That certain norms were accepted by all is shown as well by boilerplate phrases, such as "the standard interest will be added," or "the interest of the god Shamash will be added."[27] It is clear, however, that the customary rates were not always charged, and variation is visible, even within a single archive. For example, the preserved records of the twenty-first century moneylender SI.A-a[28] include fifty-two loans of silver, barley, and, more rarely, wool and sheep. These rates are found for silver and barley[29]:

Silver	Barley
20 percent: ten times	33.33 percent: twenty-three times
0 percent: four times	25 percent: once
	10 percent: twice
	6.25 percent: once
	0 percent: once

Different interest rates could even be charged within the same transaction when it involved various persons. An example of such a transaction can be pieced together from a set of loan records found together in the same house in the city of Ur. The owner of the house was one of the debtors, Dumuzi-gamil.[30] The earliest record, dated to the year 1796, states:

> Of the 1 mina (i.e., 480 grams) of silver that Dumuzi-gamil and Shumi-abija have borrowed from Shumi-abum, .5 mina and 9 shekels (i.e., 312 grams) is owed by Shumi-abija, .5 mina and 7.17 shekels (i.e., 297.3 grams) is owed by Dumuzi-gamil. They swore an oath. Before seven witnesses (their names are listed). On day three of month two of the year following the one when the canal of justice was dug.[31]

While it could be assumed that the two partners each got a different amount of the principal originally loaned, this is proven wrong by the tablet that records Dumuzi-gamil's repayment of the loan five years later. It states:

> From the 1 mina silver, capital in a partnership that Shumi-abum is owed by Dumuzi-gamil and Shumi-abija, the son of Igmil-Sin, Dumuzi-gamil paid out .5 mina and its interest for five years to Nur-ilishu and Sin-ashared. Before five witnesses (their names are listed). In the third month of the second year after the capture of Isin.[32]

There is little doubt that the same loan is involved in both records, and they show how Dumuzi-gamil paid less interest than his business partner. Both paid a higher than customary rate of 20 percent: Dumuzi-gamil 23.9 percent, Shumi-abija 30 percent. That level could be explained, however, by the long duration of the agreement (five years). If we recalculate these rates on an annual basis, we arrive at 4.8 and 6 percent per year, respectively.

The differences in interest rates was certainly due to the varied social circumstances in which loans were issued. Two individuals who engaged in a credit agreement most often had a broader relationship with each other as well, and the nature of that relationship influenced how they regarded one another. Two close friends or family members interact unlike two men who are merely business partners. Businessmen who had a loan history together would probably set the interest rate based on the outcome of the old transactions, and so on. Since the essence of a loan was an agreement between two people, the interest could be negotiated between them, albeit guided by convention.

A special category of loans was issued by temples, whose gods appear as creditors in the contracts. Most often the sun god Shamash, the god of justice, was attested in this role. Such arrangements regularly included a person as a joint creditor; most likely temples used entrepreneurs known as moneylenders to act for them. These loans were probably given to help out poor people.[33] Some of them—interestingly, only those in which the god acted alone without a human collaborator—were to be repaid with a simple meal replacing the interest.[34] Others contained the clause that the loan was to be repaid when the debtor "was sound and well."[35] Some people seem to have appealed to various gods at the same time, as these two contracts, dated two days apart in 1722, show:

> One and two-thirds shekels (i.e., 13.3 grams) silver from the gods Sin and Adad, Iagunum received. When he is sound and well, <he will repay> the gods Sin and Adad.

The gods Shamash and Marduk are witnesses. On day 17 of the eighth month in the year of the wall of Kish.

Four shekels (i.e., 32 grams) silver of the god Shamash, from the god Shamash, Iagunum received. When he is sound and well, he will repay the god Shamash. The gods Sin and Marduk are witnesses. On day 19 of the eighth month of the year that Samsuiluna, the king, <built> the wall of Kish.[36]

The temples could thus hand out loans for people in distress to be repaid when they were in good health or financially solvent.

Many other loans were interest free, which suggests that they were intended to help someone out rather than to make a profit. Such loans were most likely made to friends and neighbors and have to be seen as important for maintaining good relations. A loan can only be fully understood in context. Unfortunately, the circumstances did not merit recording by the ancient scribes who were simply interested in providing a legally binding note that a transfer of property had taken place. This absence from the record should not lead the historian to think that such factors did not play a role, however.

The creditors were often not concerned with being repaid. Many loans in Babylonia were antichretic, in other words, the interest on the capital was not paid in a commodity but as service—usually labor—provided by the debtor. For the duration of the loan the borrower supplied his or her own labor, or that of a family member or a servant as a substitute. Contracts of this nature abound—for example, this slightly damaged one from the seventh month of 2029:

> [x bushels] of barley <Ili-mishar received from X>. Instead of the interest, Ili-mishar placed Shelibum, the son of Ili-mishar, for five years <with X>. Ili-mishar swore by the name of the king not to take him away. Before five witnesses (their names are listed). In month seven of the year that <king Shu-Sin> built the temple of Shara in Umma.[37]

These types of arrangements are first attested in the twenty-first century in northern Babylonia where institutional control over land and the economy was less prevalent than in the south. Wealthy individuals were unable to personally cultivate all the land available to them and were in desperate need of labor. Labor was in short supply, however, and it was hard to hire farmhands when most had to work their own fields in order to feed their families. The loan provided a way out; in lieu of interest, borrowers could be asked to work as long as their loan was outstanding. It thus benefited the creditor not to be repaid in barley or silver, as labor remained available and the debtor was in a state of servitude. Meanwhile, the creditor could often also claim the usufruct of the debtor's fields, thus increasing the area under his own control—but he also increased his need for more labor, creating a vicious circle.[38]

The practice of debt servitude expanded further in the early part of the second millennium, providing a flexible labor force for the wealthy landowners. They could even release the debt slaves in seasons with little agricultural work, thus reducing their own expenses.[39] Debt servitude seems to have become so pervasive in the second millennium that it also became subject to annulment by royal decree. King Ammisaduqa of Babylon (r. 1646–1626) stated:

> If an obligation has resulted in foreclosure against a citizen of Numhia, a citizen of Emutbalum, a citizen of Idamaras, a citizen of Uruk, a citizen of Isin, a citizen of Kisurra, or a citizen of Malgium, <in consequence of which> he [placed] his own person, his wife, or his [children] in debt servitude for silver, or as a pledge—because the king has instituted the mīšarum in his land, he is released; his freedom is in effect.[40]

In modern times interest rates are expressed as per annum, and scholars today almost always assume that the same applied in Babylonia. That was not true, however, and the recorded amount of interest was added whatever the duration of the loan.[41] The language of the documents themselves makes this clear since they merely state the amount of interest is to be added to the principal. For example: "ten shekels of silver, an interest of two shekels is be added," or "seven shekels of silver bearing interest, the interest per shekel is one-fifth." Moreover, the declarations in the law collections, quoted above, do not include a time frame for the amounts of interest to be added. There are also a number of loans in which the amount to be repaid seems to add automatically the full interest of 20 percent for silver or 33.33 percent for barley, without consideration of the time involved.[42] This is most striking in an early second millennium text, whose exact date is unclear:

> One hundred thirty-three and one-third kur of barley as a *hubuttatum*-loan for two years without interest, Shamash-nasir, the military governor, son of Sin-iqisham, received from Ilshu-nasir and Nanna-shitim. If he does not return the barley in the third year, interest will be added. Before three witnesses (their names are listed). In the year that Rapiqum was destroyed.[43]

It seems likely that the loaned amount was actually 100 kur, and that the 33.33 percent interest was hidden by expressing it within the terms of the principal in the first line of the contract. Finally, the lengths of Babylonian years differed. Because of the use of a lunar calendar, with months of thirty days each, it was necessary at times to add an intercalary month, and these did not appear on a regular basis until the first millennium. What fraction of the year was represented by a couple of weeks could not be determined with certainty until the year was fully finished. While a Babylonian scribe certainly had the mathematical skills to calculate a fraction of an annual interest, he would have been baffled in those years that had thirteen rather than twelve months. These factors lead to the conclusion that the rates of interest stated were applied for the duration of the loan, regardless of length.[44]

Since many loans were taken out for short periods of time immediately before the new harvest, the rate of interest per annum was substantially higher than the 20 or 33.33 percent stated. A 20 percent interest charged on a ten-day loan, for example, would amount to 720 percent in our annual system, even ignoring the idea of compound interest. Such usurious practices are not uncommon in peasant societies when people usually take out loans only as a last resort. Yet these rates can also be found in modern urban settings. It was very common in early twentieth century American cities for people to borrow $5 on Saturday to be repaid with $6 on payday the next Friday, so that they could go out on Saturday night. That amounts to a weekly interest rate of 20 percent, an annual one of 1040 percent![45] While this sounds like an impossible burden, people were able to pay it because the sums involved were so small.

Since most preserved loans covered periods shorter than a year, the concept of compound interest was not important in Babylonia. Even longer-term loans, such as the two-year example quoted above,[46] often do not show interest higher than the customary rate. There are some indications, however, that the idea of compound interest existed, and that a defaulted interest could itself be subject to interest. The earliest evidence of arrears in payment suggests this. The information is provided not by a contract but by a royal inscription that describes the history of the conflict between the city-states of Umma and Lagash in the south of Mesopotamia. Enmetena, who ruled Lagash shortly before 2400, describes how the war began over an agricultural area that both states claimed as their own. In the days of his uncle, the border had been demarcated leaving a strip of Lagash's territory under Umma's control. Enmetena states:

> The leader of Umma would exploit 1 guru of the barley of Nanshe and the barley of Ningirsu as a loan. It bore interest, and 8.64 million guru accrued.[47]

This seems to indicate that, according to the claims of the ruler of Lagash, Umma farmed part of its territory and owed some of the annual yields as payments. But Umma had failed to pay up. After some forty or fifty years the grain owed—yields plus the interest charged—had accrued to the gigantic amount of 8.6 million guru, 4.5 trillion liters! The exact quantity of barley this involved is probably not important, except that it was so staggering as to cause a war.[48] The passage seems to indicate that the concept of compound interest was already established and that the amounts had grown so large because the unpaid interest on the arrears was considered to be an interest-bearing loan as well. In the actual contracts at our disposal we do not have clear evidence of such a concept, however, and possibly the interest was an element to be negotiated between debtor and creditor.[49]

* * *

Loans with interest are thus first attested in Babylonia. They remained a constant feature of that region's financial system until the end of the cuneiform documentation in the late first millennium B.C. Our use of the terms "loan" and "interest" suggests that the arrangements of the past were similar in nature to those in the present. In the modern capitalist economy, credit is crucial for the creation of new enterprises and interest charges are often the only income for some institutions and individuals. These concerns did not exist, or were much less important, in the periods discussed here and in later periods of antiquity, although this remains an issue of intense debate among scholars. Many historians argue that the ancient Mesopotamians did not raise cash to start a new business or did not try to increase their assets by issuing loans with interest. The evidence can often be interpreted in different ways, and the resultant reconstructions present opposite visions. This debate cannot be settled here as it reflects deep differences in opinion about the nature of the ancient economies, and the empirical data will not provide a clear verdict. In any case, it is crucial to see the credit transactions within the social and economic contexts of their time, and these were very different from the situations today.

From Babylonia the concept of loans spread out all over the Near East by the third millennium. Egypt was an exception; loans with interest are not attested there before the ninth century.[50] The Greek world may have accepted the idea of interest from the Near East between the tenth and eighth centuries when it was exposed to many influences from the east.[51] Because of the different system of weight and measures the customary interest rate was lower. The Greeks used a decimal system in accounting, and for their interest they often added one drachma per mina each month, hence charging only 12 percent per year.[52] Similarly, the early Romans added one one-hundredth a month, thus also arriving at a 12 percent interest rate.[53] Because of the lack of documentation in the Near East after the disappearance of cuneiform as an administrative script in the third century B.C., we cannot study its further evolution there. But Islamic precepts against usury, prohibiting any interest at all, may have been a reaction against the heavy burden imposed on those who had the misfortune to need a loan.

2
Roman Shares

ULRIKE MALMENDIER

The publicly held company, or corporation, marks the height of the evolution of business organizations. Based upon the highly abstract concept of a "legal personality," the emergence of the corporation has opened new doors for market interaction and economic growth.

Three features of the corporation are of note. First, its existence is not affected by the departure of individual members. This stability enhances its ability to participate in economic transactions. Second, designated members of the company can represent it, in other words, they can enter contracts without assuming rights or duties themselves. Instead, the company becomes the bearer of all obligations. This simplifies both the relationship between the company and its members and the relationship among its members. Third, the provision of financial capital does not entail managerial involvement and investor liability is limited. Moreover, ownership is fungible and shareholders can react to changes in a firm's prospects or in their personal financial situation by buying or selling shares. The separation of ownership and management makes it easier to attract human and financial capital. At the same time, the fungibility of ownership alleviates the agency problem of misaligned incentives between managers and shareholders.

Historians and economists have long asked when and under what circumstances such a refined institution first

arose. While the idea of offering shares in enterprises may date back further,[1] most papers and monographs on the history of the corporation identify the East and West India Companies, which emerged during the early seventeenth century, as the world's first business corporations.[2] In this chapter, I argue that over two thousand years earlier the Roman *societas publicanorum*, or "society of publicans" anticipated the modern corporation and, in particular, the use of fungible shares with limited liability.

Rise and Fall of the *Societas Publicanorum*

The publicans were "government leaseholders" or contractors with the Roman government. The Greek historian Dionysius of Halicarnassus (first century B.C.) first mentions such leases in his *Antiquities of Rome* for the year 493 B.C. He reports that Consul Postumius contracted out the building of temples for the deities Demeter, Dionysus, and Kore.[3] Two characteristic examples of leases from the fourth century B.C. are the provision of the *equi curules*, the horses for the *circus*, and the feeding of the geese on the Capitol.[4] The white geese received government-sponsored meals since, in 390 B.C., their honking had warned the Romans of the attacking Gallic troops.[5] Pliny reports that the censors (government) leased out the feeding of the geese.[6]

The companies of these *publicani*, the *societates publicanorum*, are first mentioned by Livy. In *Ab Urbe Condita* he describes the leasing of supply deliveries to the Roman army in Hispania during the Second Punic War in 216 B.C. and refers to "three companies of nineteen people" that "wanted to enter a government lease."[7] From details on their contract negotiations with the government (e.g., exemption from service in the army—a privilege usually reserved for priests and senators—and coverage of shipwrecks or any accidental damage at sea with public funds) the *publicani* emerge as experienced businessmen, well versed in negotiating with the government. Livy's *societates* appear to have had considerably more capital at their disposal and dealt with larger ventures than the *publicani* of earlier centuries.

Moreover, Livy gives us the impression that government leaseholding was a well-established business:

> When the *censores*, due to the emptiness of the state treasury, wanted to abstain from contracting out the restoration of the temples and the provision of circus horses and similar duties, those who usually participated in the auctions for such contracts assembled in large numbers and encouraged the *censores* to act as they usually did and to sell the contracts as though the treasury were full; no one would ask for repayment before the end of the war.[8]

The protest of the *publicani* implies that the allocation of such contracts had been ongoing for some time and that government leaseholding was an important business activity. In fact, the ancient sources bring up an astonishingly wide range of activities of the *publicani*. The different types of government leases with the *publicani* can be roughly divided into three groups: provision of services or supplies for the public, utilization of public property, and collection of public revenues.[9]

The first group was called *opera publica et sarta tecta*.[10] The *opera publica*, or *locatio operum* involved either the delivery of movable property or the erection of new buildings. *Sarta tecta* are processes of renovation, literally "roof-mending."[11] This first group of leases included the supply of troops with both equipment and provisions,[12] and the construc-

tion, renovation, and maintenance of streets, city walls, temples, markets, porticos, basilicas, theatres, aqueducts, public sewers and the *circus*.[13]

Some smaller services were less important financially, but crucial for the religious and public life of ancient Rome. Private entrepreneurs installed statues,[14] convened the *centurion* committee,[15] managed religious services and rituals such as painting the face of the Jupiter statue with vermilion on the festival days, and administered the *funus publicum* (the "public funeral"). The fact that these important tasks were given to the *publicani* implies that the contracting system and its implementation were well developed and reliable.

In the second group of public leases, the public property rights transferred include grazing rights on the *ager publicus* (the "public domains"),[16] mining rights,[17] and fishing rights in the *lacus lacrinus*, a Campanian lake famous for its rich fishery.[18] Other examples are the utilization of *picariae* (pitch workshops), *silvae* (forests), *cretifodinae* (clay pits), and *lapicidinae* (stone quarries).[19]

The most (in)famous leases are those of the third group, the collection of taxes, tolls, and other dues. The *publicani* "leased" the right to collect direct (poll or land) taxes from the inhabitants of the provinces[20] and to collect indirect taxes (customs or dues). Cicero lists the three most important types of dues: the port tax (*portorium*), the tithe (often referred to as the *decuma*), and the agistment (*scriptura*).[21] Another indirect tax, the inheritance tax (*vicesima hereditarium*), played financially a relatively modest role as Cicero pointed out: "With port dues in Italy abolished, and the Campanian land divided, what home revenue remains except just the 5 percent inheritance tax?"[22]

The rapid growth of the government lease system, as reflected in the wide range of contracts, resulted from the political and geographical expansion of Rome following her victory in the Punic wars. The provinces provided increasing opportunities for revenue extraction, and the government leaseholders became a "class" or an *ordo publicanorum*.[23] After the *lex Claudia* barred the senators from participation in speculative enterprises, including government leases, in 218 B.C.,[24] this business was taken over completely by the equites,[25] the class of knights that had already formed the majority of *publicani* before. The last decades of the Republic became the Golden Age, and the apex of the *publicani*'s political and economic power.[26]

With the decline of the Roman Republic, the knights and thus many of the *publicani* were subject to proscriptions.[27] Legal reforms restricted the domain of their activities to the collection of taxes and dues.[28] All other activities were assumed by direct imperial agents. Moreover, Augustus installed a procurator Augusti to handle all tax collection contracts in Gaul, Asia, and eventually in all of the imperial provinces.[29] The process of tax collection, though still leased out, became more similar to a centralized tax collection system. Subsequent emperors of the Julio-Claudian dynasty eliminated more and more of the remaining public leases, and by the second century A.D., under Trajan and Hadrian, only a few taxes remained leased out (e.g., the *vicesima hereditatium*, the 5 percent inheritance tax). The large associations of leaseholders vanished completely by the second century A.D.[30]

Along with these limitations in scope came other legal restrictions. The *publicani* lost the right to seize property as pawns in order to settle their claims against debtors; the right to search taxpayers' belongings and persons was restricted; and all persons authorized to collect taxes had to be registered.[31] All these new regulations made public leaseholding a much less attractive enterprise. Without the support of the government, the *societas publicanorum* drifted into obscurity.

Sources

The disappearance of the *societas publicanorum* under the Roman emperors had severe consequences for its historical record. Our primary source of Roman law, the *Corpus Iuris Civilis*,[32] was compiled after the *societas publicanorum* disappeared. It discusses legal opinions from the classical and postclassical period (first to sixth century A.D.), but no preclassics. The jurists cited in the *Corpus Iuris Civilis* mention at most the *publicani*[33] and the *societates vectigalium*,[34] but only in the sense of smaller tax collectors and their firms. We will thus turn to alternative sources—classical Roman and Greek literature and inscriptions, which are largely unexplored in the literature on legal history—to provide evidence on business corporations and shares in ancient Rome.

The *Monumentum Ephesenum*, discovered in Ephesus in 1976, deserves special attention among the inscriptions. It is a former ambo of the St. John's Basilica in Ephesus and had been reused as a step at the entrance. One side of it hid a Greek inscription, which turned out to be the translation of a Latin tax law, the *lex portorii Asiae*, or Νόμος τέλους Ἀσίας, from 62 A.D.[35] This *lex* is an example of the *leges locationum*, or *lex censoria*, that governed the contractual relationship between the private entrepreneur, *publicanus*, and the government, represented by the *censor*, in a governmental lease. Over time a basic stock of set clauses developed for most contracts and was reused in each new lease.[36] The *lex portorii Asiae* is such a stock of preset contractual clauses for the lease of tax collection rights in the province of Asia. Its nucleus, paragraphs 1–36, originate in the late Republic, 75 or 74 B.C.(see pp. 41–42 for a few characteristic excerpts).[37] Paragraphs 37–63 are supplementary measures and decrees by later consuls.[38]

The *leges* primarily governed three areas of the contractual relationship between *publicani* and the "Roman people" (as represented by the Roman censor). The first area was the object of the lease (i.e., the rights leased by the *publicani* or the services to be supplied by them). In the case of the *lex portorii Asiae*, the *leges* specify the type of tax (*portorium*) and details on the cities and places in which "tax collection was admitted according to senatorial decree, law, or plebiscite."[39] We also find details on tax exemptions, "for which kinds of exports from or imports to Asia no customs shall be paid."[40] Even the issue of double taxation is addressed:

> If the right to collect the tithe on grain, wine, or oil has been leased to publicans in the name of the Roman people, [other] publicans may still collect the customs on those goods, as it has been contracted with the Consuls Lucius Octavius and Gaius Aurelius Cotta.[41]

The second area governed by the clauses was the terms of payment. In the case of tax-farming, a fixed sum, to be paid in installments over the course of the contractual period, seems to have been the common arrangement. The *lex portorii Asiae* specifies annual payment on the Ides of October:

> [The p]ublican who has contracted with the Roman people to collect taxes shall make payment [to the Aerarium Saturni, i.e., the treasury] on the Ides of October of the year in which he exercises his right.[42]

Finally, the third type of provisions dealt with collateral. In the case of the *lex portorii Asiae*, "the publican has to provide the Roman people with guarantors and sureties."[43] We

Monumentum Ephesenum. Inscribed marble. 62 A.D. The Monumentum Ephesenum bears an inscription with Roman tax laws for the province of Asia. It was found in 1976 during excavations of the ancient city of Ephesus in modern day Turkey. At some point in history the public monument was pulled down and the stone recut for reuse as a dias or ambo in St. John's Basilica in Ephesus. One side hid a Greek translation of a Latin *lex portorii Asiae* from 62 A.D. which specifies the contractual relationship between *publicani* and the Roman people.

will explore the contractual clauses of the *lex portorii Asiae* and numerous literary sources to complement the *Corpus Iuris Civilis* and to study the *societas publicanorum* during the time of its greatest expansion, the Roman Republic.

Organization and Legal Status

The large-scale and long-term business activities of the *publicani* naturally called for a sophisticated legal and organizational framework and, in particular, incorporation, with all the advantages enumerated in the introduction. Roman law, however, proved to be rigid and inflexible. In fact, the slow development of the ancient Roman economy has often been attributed to the lack of dynamics and adaptation in the legal system.[44] The law of business organizations is no exception. The only legal form of corporative organization outside the public corporations, i.e., *populus Romanus* (state), *aerarium* and *fiscus* (state and imperial treasuries), and *municipia* and *coloniae* (municipalities outside Rome), was the *collegium* (association). The *collegium*, however, was restricted to organizations with "public purpose" such as religious and political associations.[45]

Thus, business organizations had to be established as *societates*. The societas is a contractual union of a group of people formed to promote a common purpose.[46] The *publicani* met the four essential criteria for forming a *societas*, namely, contributions of the partners,[47] common interest, a lawful business goal, and the *affectus societatis* (i.e., the will to form a societas). In fact, the organization of *publicani* is referred to as a *societas* at least from the third century B.C. on.[48] Throughout the centuries of government leases in Rome until the final period under the Roman emperors, the organization of the *publicani* seem to have remained a form of *societas*, since Ulpian explains:

> *Societates* are formed either as universal partnerships [i.e., concerning all the property of the partners], or as partnerships for a specific business or for tax-farming for a tax or for a single event.[49]

The basic *societas*, however, did not form a separate persona. Partners assumed rights and obligations among each other but were in no position to represent the societas as a whole. And "company property" did not belong to the company, but to the *socii* in common ownership. Moreover, the *societas* was automatically terminated if a *socius* died or renounced his partnership. Even the initiation of an *actio pro socio*, an action of one partner against another partner for the settlement of accounts, was considered a renunciation.[50] The partners of a *societas* could not stipulate that the *societas* should persist beyond the death or renunciation of a partner.[51] Other deficiencies of the *societas* for the purposes of the *publicani* were that, at least during Republican times, profits and losses had to be shared equally among all *socii* and liability could not be limited.[52] This made it hard to attract outside capital.

The solution to this dilemma—the reluctance to change the legal system, on the one hand, and the government's need for corporate organizations, on the other hand—is characteristic for the evolution of Roman law. Insisting on the *societas* as the only legal form for the organization for the *publicani*, the Romans developed a series of "special rules," applicable only to the *societas publicanorum*. These special provisions gave the *societas publicanorum* the de facto status of a modern corporation.

As a first important step toward the evolution of a corporation, permanence of the organization was guaranteed, even after the death of a *socius*, or "member of the *societas*." We do not know when exactly this provision was implemented; but it retained validity even into the first centuries of the Roman Empire, then applying to the only surviving form of *societas publicanorum*, the organization of the tax farmers (*societas vectigalium*), as Pomponius describes:

> Upon the death of a partner the *societas* is dissolved, so that we cannot state without reservation that the heir of a partner inherits membership in a partnership. This is indeed the case with regard to private partnerships, but in the case of the society of tax collectors, the partnership remains in existence even after the death of one of the partners, as long as the deceased partner's share was bequeathed to his heir, so that it must be conferred upon him. Whether this happened depends on the case, for what if the deceased had the main responsibility for the formation of the partnership or if the partnership could not be managed without him?[53]

This and other fragments from the Digest[54] make clear that the *societas publicanorum* could continue to exist even after the death of one of its partners, whether the heir of the deceased joined as a new partner or not. According to the Ulpian quote above, the only

exception was the death of the *manceps*. The *manceps* was the socius who bid in the auction for the government contract and eventually signed the contract. As Festus defines:

> Somebody who buys or leases from the people is called *manceps* since he indicates by raising his hand (*manus*) that he is willing to buy (at an increased price.)[55]

The *socius* of a regular *societas* could instead not enter contracts in the name of the *societas*. Rather, the individual had to assume all contractual obligations himself. In the case of the government leases, the *manceps* was the bearer of all rights and obligations from the contract with the Roman state, not the *societas*.

The *socii* would typically choose the most respectable and esteemed person among them to be *manceps*, which made him the *princeps inter suos*, "the first among equals."[56] Given his central role in the societas it becomes clear why his sudden disappearance would end the contractual relationship among the *socii*. On the other hand, both the *socii* and the government would have wanted to continue the contractual relationship—among the *socii* as a *societas publicanorum* and between *socii* and the Roman people as government leaseholders—even without their prior *manceps* if his position happened to be filled by another person.

The *lex portorii Asiae* reveals how the Roman legislator resolved this tension without abandoning the *societas*. According to paragraph 46, the consuls Nero and Lucius Calpurnius Piso decreed in 57 B.C. that "over the next twenty days it [shall be admissible to replace] the *manceps*."[57] In other words, the *publicani* had the option to substitute the *manceps* with another person for a limited period after contract conclusion. From 5 A.D. on, even annual changes were permitted: "the *praetores* of every year shall allow [the *societas*] to substitute the *manceps*."[58] That way, the censors established contractual continuity of the relationship between a *societas publicanorum* and the government despite the replacement. Given Rome's refined law of obligations, this "inconsistency" is a clear indication that the societas publicanorum is acknowledged as a separate legal entity.

Finally, the *societas publicanorum* also survived the *actio pro socio*, as Paulus writes:

> Occasionally it is necessary to go to court against a partner, but keep the partnership alive; for example when a partnership is formed for tax collection and, because of the various contracts, it suits neither party to withdraw from the partnership.[59]

The *action pro socio manente societate* allowed the *publicani* to deal with internal disputes without having to dissolve their contractual union. The association of *publicani* thus acquired a permanent status, which transformed it into an independent entity in economic transactions.

The second step toward a "corporation" concerned the right of representation. Gaius reports:

> Those organizations who are granted the right to incorporate, either as *collegium* or as *societas* or in any other form, typically have a representative or syndic, through whom, just like in a state, everything that needs to be done and needs to happen for the community gets done and happens.[60]

This statement needs to be seen in context with the *principium* of this fragment where Gaius explicitly notes that the *societates vectigalium* are counted among the organizations

with *corpus*.[61] The Gaius text indicates that the process of legal change in the status of the *manceps*, initiated during the Republic, resulted in the capacity to represent the company, even though the Romans never generally accepted the legal concept of representation.

The next crucial difference between societas and *societas publicanorum*—and maybe the most astonishing step forward in the evolution of this business organization—was the existence of shares and shareholders. Cicero mentions the *partes* (shares) numerous times in speeches. For instance, he refers to private citizens possessing partes *societatum publicanorum*.[62] He refers to shareholders as *participes*;[63] other authors denote them as *adfines*.[64] Cicero speaks of *magnae partes* ("large shares").[65] Valerius Maximus mentions the particula ("little share") of T. Aufidius.[66] This implies that shares of different companies came in different nominal values.

We also learn that the shares were traded. In his second speech against Verres, Cicero implies the transferability of shares, when he quotes an exceptional restriction: *Qui de L. Marcio M. Perperna censoribus redemerit . . . socium non admittito neve partem dato neve redimito*, that is, anyone who had been leasing under the censors L. Marcius and M. Perperna was not admitted to the current lease, neither as a partner, nor as a shareholder, nor should he be allowed to buy any shares later.[67] His quote and the context of the case reveal that shares were often traded between *participes* after the contract had been assigned to a *societas publicanorum*. A common trading place was supposedly near the Temple of Castor on the Forum Romanum.[68]

What makes the *partes* look even more like modern shares—and is additional evidence that *partes* were not just loans with variable interest rate, as proposed by P. W. Duff[69]—is the mention of variable "stock prices." Cicero speaks of *partes illo tempore carissimae*, of "shares that had a very high price at that time."[70] He implies that the value of the shares depends upon the success of the enterprise and was as such subject to fluctuations, just like today's stock market. In fact, the "stock-market jargon" in this and similar quotes have led some scholars to believe that a "stock-market life" existed in Rome.[71]

How much of a stock market there was in ancient Rome may remain in obscurity. What we do know, though, is that ownership and other involvement in the *societates publicanorum* was widespread among the Roman population. According to Polybius, by the second century B.C. "almost every citizen" participated, in one form or another, in the government leases.[72] Polybius specifies four forms of participation: those who contract with the censors, the partners of the contractors, the providers of sureties, and investors, literally "others [who] pledge their own fortunes to the state for this purpose."[73] Similarly, Cicero claims that many citizens were financially involved in these businesses.[74]

The most important elements of the modern corporation thus seem to have been granted to the *societas publicanorum*. The existence of the *societas publicanorum* did not—to a large extent—depend on the individuals involved, a representative could act "for the company," ownership was fungible, traded in the form of shares, and separated from the control of the company.

Does this make the *societas publicanorum* the first Roman business corporation? It seems so when Gaius counts the *societas publicanorum* among the organizations with a "corpus"[75] or when Cicero reports about a *societas publicanorum* that "it consists of other societates [publicanorum]"[76] and thus assumes the role of a natural *persona*.

Other fragments of the Digest point in the same direction. The *societas vectigalium* could sue and in particular file the *actio furti* against fraud or embezzlement.[77] The company could own property[78] and inherit items.[79] Like a summary, the Digest proposes that

The Forum Romanum

the company could act like a person. This corresponds exactly to the modern classification of corporations as "legal personae."[80]

All of these texts from the Digest, however, reflect classical (and postclassical) jurisprudence from the first century A.D. on. What about the time of the greatest expansion of the *societas publicanorum*, the time of the Roman Republic? From references to earlier legal rules, such as an edict[81] on corporations, however, we know only the *collegium* and state-related associations were identified as corporations, not the *societas publicanorum*.[82] On the other hand, we also know from earlier literary sources and from the *lex portorii Asiae* of the existence and (legal) acceptance of corporate elements of the *societas publicanorum* from the second century B.C. on.[83]

To understand this lack of corporate law, note that the questions "what is a corporation?" and "what does it mean to have legal personality?" do not receive much attention in the *Corpus Iuris Civilis*. In the entire Digest, we only find two—relatively short—titles pertinent to these issues.[84] The Roman terminology is rather imprecise, lacking a word for "corporation" and a clear distinction between the corpus and its members. *Universitas* may be closest, but is not used consistently.[85]

These "inconsistencies" between corporate law and corporate practice, though, are inconsistencies really only from a modern perspective. To ask whether the *societas publicanorum* was a corporation or not under Roman law is, in some sense, anachronistic. The concept of a "legal persona" was formed over the centuries. It underwent major reinterpretations in the sixteenth century and was the subject of extensive theoretical debates in the nineteenth century, most prominently between the "Romanist" legal scholar Friedrich Carl von Savigny and the "Germanist" Otto von Gierke. Imposing the resulting modern systematization upon Roman law runs the risk of introducing much more "system" than existed at the time.[86] The Romans were concerned with the rapid transformation of their small closed agricultural economy into an open system that spanned the entire known world. What is crucial is that they managed to accommodate the practical needs of their growing economy, even without revolutionizing their company law. Applying our modern terminology, we may well call the *societas publicanorum* the first shareholder company—even if the Romans themselves would not have undertaken such categorization.

Appendix A: *Monumentum Ephesenum* excerpts

Translation based on the edition and translation by Engelmann and Knibbe (1989).

§1:
νόμος τέλους Ἀσίας εἰσαγωγῆς καὶ ἐξαγωγῆς κατά τε γῆν καὶ κατὰ θάλασσαν [τοῖς τε καταπλέουσιν καὶ τοῖς ἀνάγουσιν καὶ τοῖς ἐκ] Καππαδοκίας, Γαλατίας, Βειθυνίας Ἀσίαν ζωννύουσιν.

[This is the] Tax law of Asia for the regulation of import and export by land and sea [for (all) who arrive and depart and for (all) who] pass by Asia [from] Cappadocia, Galatia, [and] Bithnia.

§2:
αἵτινές τε χῶραι Καλχαδονίων Βυζαντίων ἐντὸς τῶν [ὅρων τοῦ στόματος Πόντου εἰσὶν ἔσονταί τε, πρὸ τῆς κ]ατὰ θάλασσαν εἰσαγωγῆς καὶ ἐξαγωγῆς ἐν στόματι Πόντου ἐν οἷς τόποις κατὰ δόγμα συγκλήτου ἢ κατα νόμον [ἢ κατὰ δήμου κύρωσιν συγκεχώρηται ἐπιτέτραπτ] αί τε τελωνείαν ἐκμισθῶσαι, ἐν τούτοις τοῖς τόποις, ἃ ἂν κατὰ θάλασσαν εἰσάγηται, ἐξάγηται, κατὰ πέραν [. . . . . ἃ ἂν . . . . . ὡσαύτως δὲ κ]αὶ ἃ ἂν κατὰ γῆν ἐκκομίζηται, ἐξελαύνηται, ἐξάγηται, τὸ τεσσαρακοστὸν μέρος τῶι τελώνηι διδότω{ι}.

For all land belonging to Chalcedon or Byzantium within the [borders of the Ostium Ponti], (or) wherever within the Ostium Ponti it has been decreed by the Senate or by law (or plebiscite) that tax collection rights can be farmed out: (there,) one-fortieth [of the value of all goods] must be handed over to the tax collector upon arrival or departure. . . .

§3:
ὑπ[ὲρ σωμάτων παιδαρίων ἀνδρείων ὑπέρ τε σωμάτων] παιδαρίων κορασίων μή τ πλεῖον τέλους ἑκάστης κεφαλῆς δηναρίων πέντε διδόναι ὀφειλέτω{ι}.

F[or male slaves that are still in their youth as well as] female [slaves] in their youth one shall not take more than five denari tax per head.

§4:
[ἅπερ ἄν τις εἰς Πόντον ἐξάγεσθαι μέλληι, πρὸ] τοῦ πόλιν Καλχάδονα παραπλεῦσαι τῶι τελώνηι ἢ ἐπιτρόπωι αὐτοῦ προσφωνείτω{ι} καὶ ἀπογραφέσθω{ι}. [ἅπερ ἄν τις ἐξ Πόντου εἰς τὴν ἡμετέραν ἡγεμονίαν εἰσάγ]εσθαι μέλλῃ, πρὸ τοῦ πόλιν Καλχάδονα παραπλεῖν τῶι τελώνηι ἢ ἐπιτρόπωι αὐτοῦ προσφωνείτω{ι} καὶ ἀπο[γραφέσθω.

[Whatever anyone desires to export to the Pontos, he shall, before] he passes the city of Chalcdon, announce and declare it to the tax collector or his proxy. [Whatever anyone desires to import into our area from] the Pontos, he shall, before he passes the city of Chalcdon, announce and declare it to the tax collector or his proxy.

ON THE LIMITS OF THE TAX LAW — HEAVILY RECONSTRUCTED

§5:
[ἅ ἄν τις κατὰ θάλασσαν εἰσάγῃ ἢ ἐξάγῃ, μὴ τ]ὸ πλοῖον ἀποστρεφέτω μήτε μήν, ἃ ἂν κατὰ γῆν ἐξφέρῃ ἢ ἐκβάλλῃ, εἰς ἑτέρους τόπους ἀποστρεφέτω χάριν [ἀποστερέσεως τέλους· ἐὰν δ' ὑπενάντιον τούτοις] τὶς ποιήσῃ, ἐπ' ἴσης ὁ νόμος ἰσχυέτω ὡσανεὶ ἀναπόγραφον ἔφερεν.

[(Anyone who) imports or exports goods by sea may not] divert his ship, nor may (a person) who imports and exports over land take a different route in order [to evade taxation. If anyone] acts [against] this, then the same law shall apply as though he were transporting goods that are not declared.

§8:
ὥνιον ἐκ πλοίο[υ μή τις δόλῳ πονηρῷ ἀφαιρείτω μήτε ἀναπόγραφον ἐκ]γευέτω τέλους στερέσεως χάριν· ἐὰν δέ τις ὑπενάντιον τούτοις ποιήσῃ, τὸ ὥνιον καὶ τὸ πρᾶγμα τοῦ [τελώνου ἔστω· καὶ ὑφαιρεθέντος τοῦ τέλους ὁ ἀγοράσα]ς εἰσαγέτω καὶ ἐξαγέτω.

[Nobody] should take goods from the ship [with bad intentions, nor should anyone take them without declaring (the goods)] in order to evade the tax. If anyone acts against this, then the [concerned] goods and the wares will pass into possession of the [tax collector. The buyer should] import and export [following deduction of the tax].

§11:
ὅπερ κατὰ ταῦτον τὸν νόμον ἀπογράφεσθαι [δεήσει, τοῦτο ὁ εἰσάγων ἀπογράφεσθαι ὀφειλέτω καὶ μετὰ τὸ ἀπ]ογράφεσθαι εἰσαγαγεῖν.

(For) all goods (listed) in this decree as [subject to] declaration, [any person who imports (these) must declare them and must subsequently] import them following their declaration.

§18:
ἃ μὲν ἄν τις βούληται] ἐξελέσθαι ἢ εἰσαγαγεῖν ἢ ἐξαγαγεῖν κατὰ θάλασσαν, ἅ τε ἂν κατὰ γῆν εἰσάγῃ ἢ εἰσελαύνῃ ἢ εἰσκομίζῃ ἢ ἐξάγῃ ἢ ἐξελαύνῃ, [τῶν πραγμάτων τούτων τὴν τείμησι]ν τειμάσθω{ι}· ὃ μὲν ἂν ἵστασθαι δέῃ, τούτου τὸν σταθμόν, ὃ δ' ἂν ἀριθμηθῆναι δέῃ, τούτου τὸν ἀριθμὸν ὀρθῶς λεγέτω. ἐὰν [δ' ὑπενάντιόν τι τούοις γέηται, τὸ πρᾶγ]μα ἐκεῖνο καὶ τὸ ὥνιον τοῦ τελώνου ἔστω.

[Whatever goods anyone desires to] import or export by sea, and what anyone imports or brings in by land or exports or brings out, [of all these goods he shall] declare [the value]. He shall declare the weight of those goods that are weighed, and the accurate number of those things that are counted. If this (rule) [is broken] the [goods] and wares shall belong to the tax collector.

3

How Business Was Conducted on the Chinese Silk Road During the Tang Dynasty, 618–907

PART I: THE RESOLUTION OF AN INTERNATIONAL DISPUTE ON THE SILK ROAD, ca. 670

VALERIE HANSEN

In 1966, the first year of the Cultural Revolution, Chinese archeologists discovered a group of affidavits in a tomb in the Astana graveyard, some ten miles east of Turfan. Offering a needle-sharp close-up of the Silk Road trade, these documents highlight the legal system officials of the Tang dynasty (618–907) devised to handle commercial disputes between their subjects and peoples from other lands with equally complex legal systems. These innovations facilitated the commercial exchanges of the Silk Road and indeed may have contributed to the surge in trade in the seventh and eighth centuries, when the Tang state poured resources into Central Asia to support its officials and armies posted there. At the time Turfan was probably the largest oasis on the Silk Road with a population of forty thousand; today it lies in the Xinjiang Autonomous Region of northwest China.

Since 500, Turfan had been the capital of the independent oasis kingdom of Gaochang. Soon after the founding of the Tang dynasty in 618, the emperor tried to persuade the rulers of the oasis states ringing the Taklamakan Desert to accept his overlordship. He signed treaties with those who agreed and sent armies to con-

The Silk Road trading route

quer those, like the king of Gaochang, who did not. In 640 Tang armies invaded the kingdom, and Turfan became one of more than three hundred prefectures in Tang China, fully subject to all the provisions of Chinese law.

Turfan was on the overland trade route skirting the northern edge of the Taklamakan Desert, now usually referred to as the northern Silk Road. Going through Dunhuang and Kashgar, the northern route connected the Tang capital of Chang'an (modern Xian in Shaanxi province), a thriving metropolis of 500,000, with its major trading partners, the city states of Sogdiana, a region straddling modern-day Uzbekistan and Tajikistan. As on the Chinese side of the Pamir Mountains, trade routes connected the oases where people naturally settled.

The residents of Sogdiana spoke Sogdian, an Iranian language distinct from, but related to, Middle Persian, and were called Sogdians. They inhabited the easternmost edge of the Iranian world, whose center lay far to the west in the Fars region of Iran. The Sasanian empire (224–651) ruled the region of modern-day Iran and Iraq, but its control did not extend all the way to the city states of Sogdiana, which were ruled by independent kings. Samarkand and Bukhara were among the most important city states in Sogdiana at the time.

Many Sogdians were true international merchants, who knew the cities and cultures of both the Iranian and Chinese worlds. Sogdian traders were active in China in at least the fourth century, if not before, and their pace of emigration increased dramatically after the mid-seventh century, as refugees fled before the advancing Islamic armies.

Sogdians brought with them their own law, which drew on the ancient texts of Zoroaster,[1] who may have lived sometime around 1000 B.C. Zoroastrian teachings held

that truth-telling was the highest good of all,[2] and rulers were obliged to implement justice in their realms in the hope that they could increase the forces of good in the world. Little is known about Sogdian law because the Sogdian legal code is not extant and only a few contracts in the Sogdian language survive.[3]

Sogdian law probably overlapped considerably with that of the Sasanian empire. The Sasanian law code is not extant, but the basic principles of Sasanian law are preserved in the seventh-century casebook *The Book of a Thousand Judgments*,[4] and a ninth-century encyclopedia.[5] *The Book of a Thousand Judgments* presents short judgments on different topics: the maintenance of religious shrines, inheritance, marriage, and various types of contracts. Although Sasanian law recognized oral agreements, in most cases the parties to a contract drew up written agreements, which were signed in front of witnesses and placed for safekeeping in the Office of Registry.[6]

The Astana Documents

Almost all the documents found at Turfan were buried in the Astana graveyard. With the exception of a single Sogdian-language contract,[7] the documents are written in Chinese, the language of administration of the Tang dynasty and also the local scribal language even before the Tang conquest. The Astana graveyard contains over three thousand tombs dating from the third to the eighth centuries. In 1915, Aurel Stein reported that all the graves had been disturbed, both by grave robbers and earlier explorers.[8]

Even so the region's dry climate has preserved a startling array of items—desiccated corpses, elaborate silks, painted wood figurines, and over two thousand documents written mainly in Chinese—making it one of the most important archeological sites on the Silk Road. Of the 465 tombs excavated between 1959 and 1975, 202 produced documents. The presence of documents testifies to the unique practice of the Turfan people who buried their dead in shoes, hats, and belts made from recycled paper, which often had writing on one or both sides.[9]

Recycled paper coffin. 769 A.D. This papier mâché coffin made from recycled documents was placed over the body of a dead official who could not afford a more elaborate funeral. When dismantled, the coffin produced 55 documents, all dating to 769, the year the official died. All came from the government office that oversaw the provisioning of long-distance horses used by government officials.

By the third century A.D. Silk Road craftsmen had learned how to make paper, invented five hundred years earlier in China.[10] The paper used in government documents and private materials was not discarded but recycled in various forms. Sometimes it found its way into funerary garments. The side with writing was often painted black to obscure the writing, but fortunately for historians, the characters sometimes remained visible. By laboriously piecing together the fragments of paper in these garments, archeologists have managed to reconstruct a wide variety of sources. Yet much from Astana was lost, as well, as this type of painstaking archeology was the exception in China during the Cultural Revolution.

Nine pieces of paper relate to the Silk Road dispute about an unpaid loan from a central Asian merchant to his Chinese partner. They range in size, with the largest measuring over fourteen inches long and eleven inches wide. Too large to have been soles for shoes, the most common type of funeral good at Turfan, they are clearly from a sewn paper garment. Needlemarks are visible in some of the photographs (see page 48, where two rows of needlemarks run along the bottom edge of the document). Could they have been part of a paper shirt? We will never be certain because none of the publications about the site either describes the paper artifacts found in tomb 61 or explains from which objects the documents were recovered.[11]

Seven of the nine documents concerning the dispute have writing on the reverse, including name lists for corvée duty and affidavits from other cases. The remaining eleven documents in the tomb (those having nothing to do with the loan dispute) are also either name lists or affidavits, an indication that the tomb's contents were all made from paper discarded by a government office, quite likely a single court. Some of these documents are dated 665, and the tomb includes an epitaph dated 673, so we know that the dispute occurred sometime between 665 and 673, when the tomb was sealed.

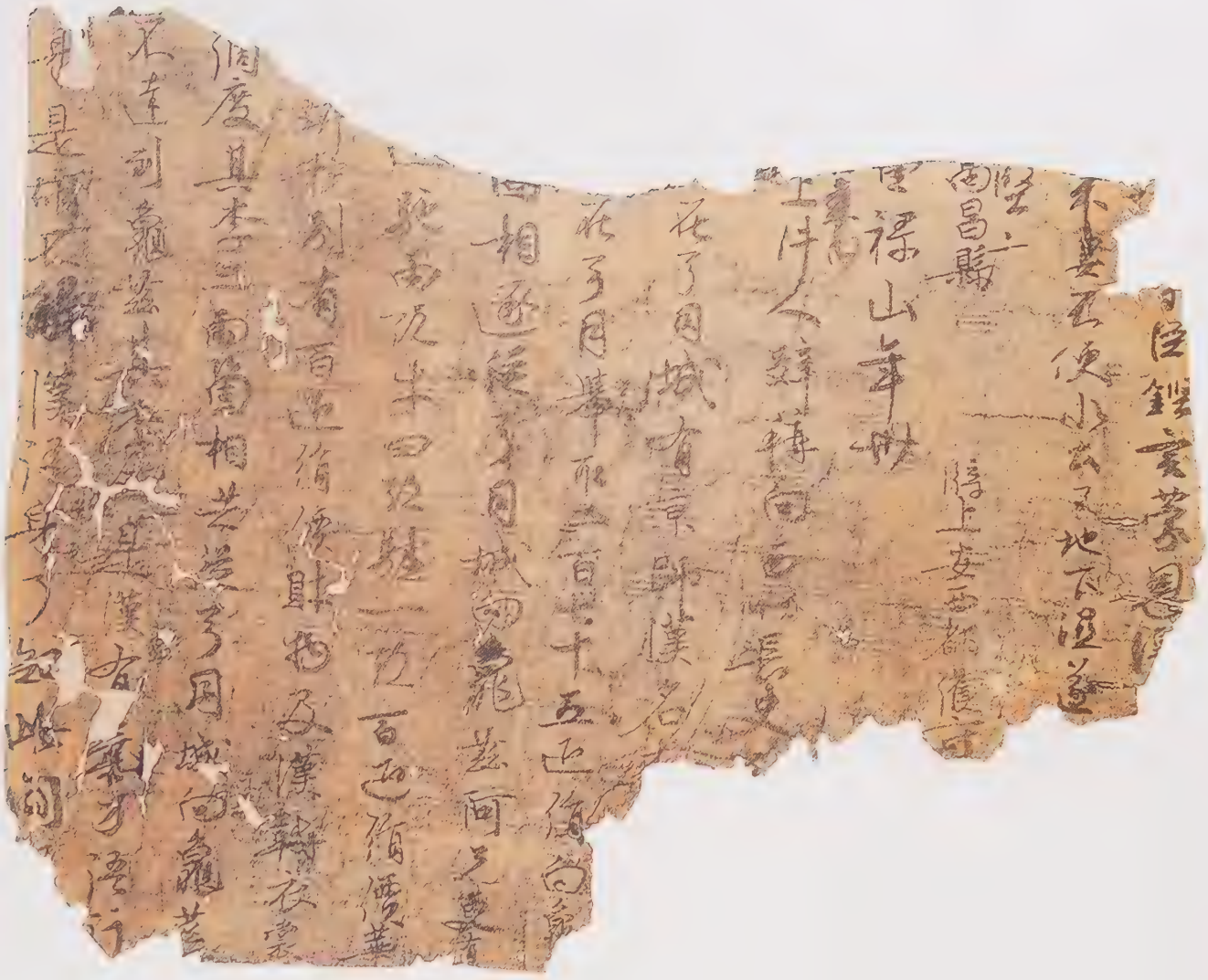
The Documents' Improbable Survival

In 665, government clerks used fresh sheets of paper to draw up name lists and to record affidavits for the Silk Road dispute. Scribes writing rapidly used a modified cursive—meaning different strokes in a single character are connected, but no strokes connect one character to another. These drafts must have been discarded since the reverse was subsequently used to record the testimony of the parties to the dispute.

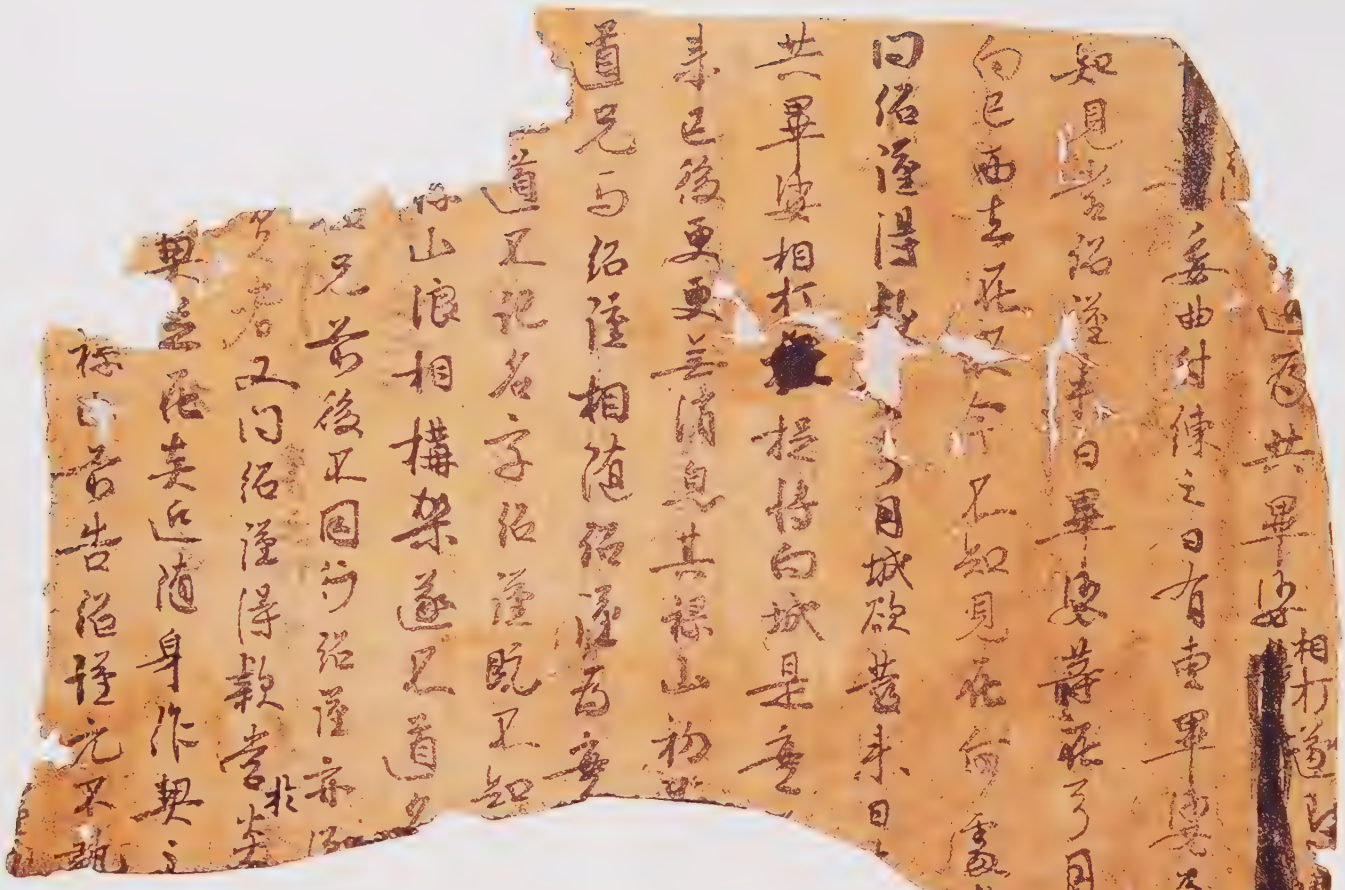
With writing on both faces, the paper could no longer be used by clerks and was probably sold as refuse. It then came into the hands of someone making funerary garments, who cut it into pieces (for a shirt?) and sewed them together. Placed in the tomb of the deceased in 673, the recycled documents remained underground in the Astana graveyard for more than one thousand years, until archeologists discovered them. They have since been dismantled and transcribed. This complicated sequence of events has resulted in unique documents; their large chunks of continuous text make them unusually informative, but also frustrating because of the many gaps at the places where they were cut.

The Facts of the Case

In 670 a Sogdian merchant brought a suit in Turfan against a Chinese merchant, Li Shaojin.[12] The merchant's Chinese name, Cao Lushan, provides important clues about his identity. The Chinese assigned Cao as a family name to those Sogdians from Kabudhan, or Gubdan, the region north of the Zerafshan River (which runs through Samarkand).



One page of a Silk Road document recording an international trade dispute. Ink on paper. ca. 665–763 A.D. The first page of a recycled paper document recording the legal proceedings involving the family of a deceased Central Asian merchant and his former Chinese partner. The dispute concerns a camel load of silk jointly claimed by the two parties. The document was likely a discarded draft recording testimony at a trial.



The seventh page of a Silk Road document recording an international trade dispute. Ink on paper. ca. 665–763 A.D. The last large section of the draft of the trial proceedings is part of an affadavit about the final meeting of the Sogdian merchant who was later killed with his Chinese partner in Gongyuecheng.Two rows of needlemarks at the bottom edge of the sheet suggest that it was later sewn into the lining of a garment, perhaps a shirt.

Lushan was the Chinese transliteration of the common Sogdian first name, Rokhshan, which means "bright" and is the masculine equivalent of the English name "Roxanne." In addition to Rokhshan and Merchant Li, the case involved two other Sogdian merchants, Cao Guoyi and Cao Bisuo. Their common surname of Cao indicates that their home region was the same as Rokhshan's, but not necessarily that they were related.

The three Sogdians and the single Chinese merchant were all residents of Changan. According to Tang law, each subject of the empire had to be listed on a household register where he or she lived.[13] These men, who traveled frequently to the different trading oases of the Taklamakan Desert, probably did not spend much time in the Tang capital, but their wives and children lived there year-round. Sogdians resided in certain districts in the capital, often near a fire altar, where they could attend Zoroastrian rites.

Rokhshan brought the suit on behalf of his deceased elder brother, Yam-yān, transcribed in Chinese as Yanyan, meaning "favor of the god Yama."[14] Yama was the Indian god of the dead who presided over the underworld. Rokhshan accused Merchant Li of borrowing 275 bolts of silk from his elder brother Yam-yān, but failing to repay him. Merchant Li denied the charges, and to make matters even more difficult Yam-yān had died several years earlier. None of the parties to the case lived in Turfan, but Rokhshan may have brought the suit there because between 670 and 679 it was the seat of the Anxi Protectorate, an administrative district including Kuche, where Yam-yān had disappeared.[15]

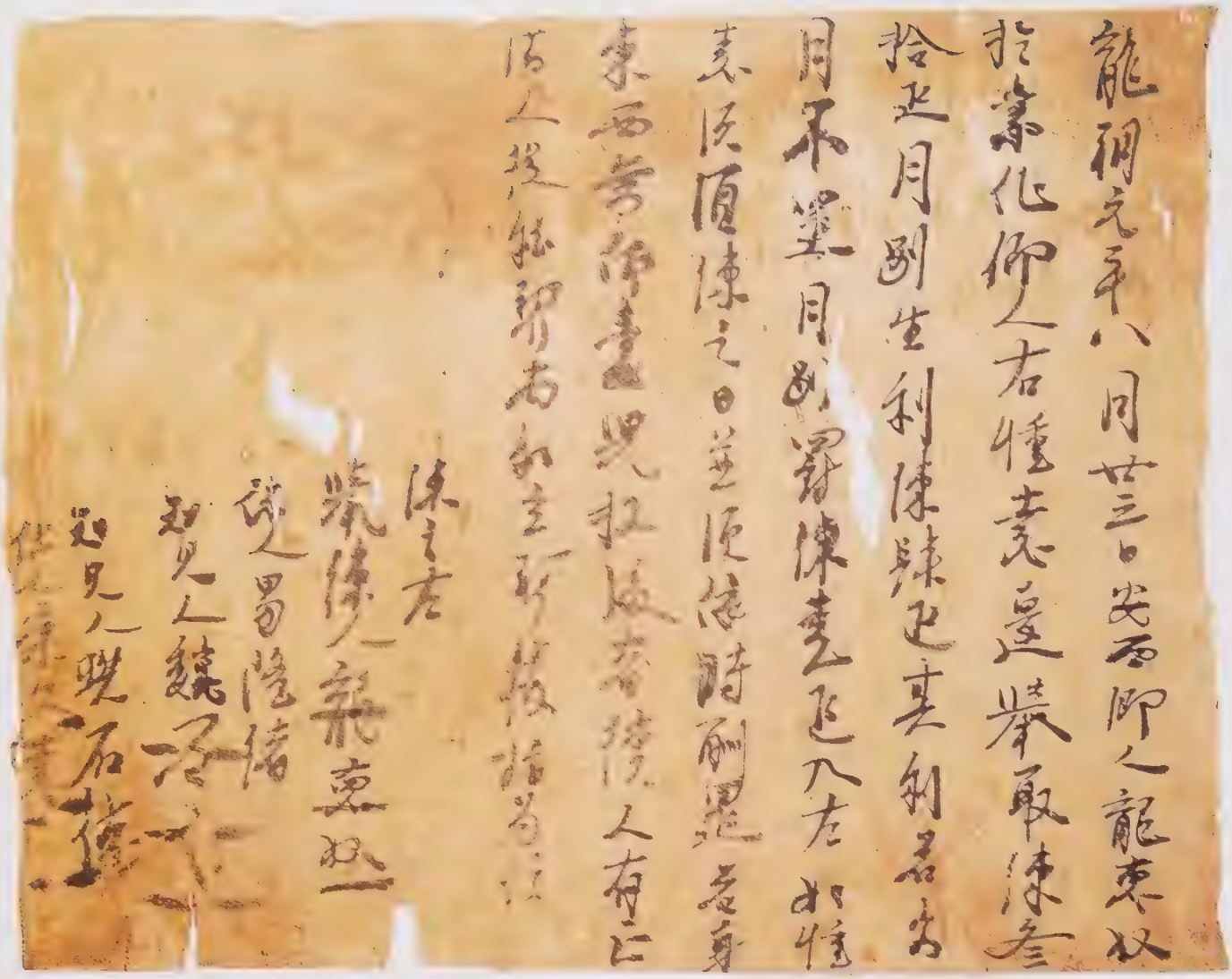
According to Rokhshan's affidavit, Li Shaojin and Yam-yān had formed a partnership in Gongyuecheng (modern-day Almaligh), which lies in the Yili River basin close to modern China's border with Kazakstan. Having no common language, the two men must have communicated through interpreters. Merchant Li then proceeded to borrow 275 bolts of silk from Yam-yān.

At the time of their parting, the two merchants agreed to meet in Kuche, some 200 miles to the south. Accompanied by his nephew, Yam-yān was leading two camels, four cattle, and one donkey that carried his wares: various goods worth 200 bolts of silk in addition to saddles, clothing, bows, and arrows. He never arrived at his destination. One witness speculated that he died at the hands of bandits who wanted his cargo of weapons and saddles.

Not surprisingly, the Chinese merchant never paid back the 275 bolts of silk he had borrowed from the dead man. In his initial affidavit, when asked whether he had received the loan, he testified, "At Gongyuecheng I never obtained the bleached silk from the Sogdian. Nor did I expect to go to [gap in text] with the Sogdian and then return to Kuche. Inasmuch as I was not in partnership with him, I genuinely don't know." His speech of denial has a curiously modern ring. Court officials asked him again and again whether he had received the loan, yet he steadfastly maintained that he had traveled alone.

Then the court officials confronted him with the testimony of two Sogdian merchants who had witnessed the original loan of the 275 bolts of silk at Gongyuecheng. Although the copy of the contract belonging to the deceased Sogdian partner had disappeared, and although the Chinese merchant must have destroyed his copy, the two Sogdian witnesses vouched that Merchant Li had indeed borrowed the silk. According to Tang law, their testimony had the same legal standing as a copy of the contract.[16]

Ruling in Rokhshan's favor, the court ordered Merchant Li to pay back 275 bolts of silk in addition to interest. We have no way of knowing whether the Chinese partner ever paid Rokhshan back, because the documents come to an abrupt stop.



Contract for loan of silk. Ink on paper. 661 A.D. This contract records the loan from a moneylender of thirty bolts of silk to a borrower who agrees to pay four bolts, or 13.33 percent interest, each month until the time of repayment. This rate was higher both than prevailing rate in Turfan, usually 10 percent each month, and the government-stipulated rate of 6 percent per month. The text of the contract appears on the right, the names of the signatories on the lower left. Nothing appears below the first name, that of the moneylender, but the borrower, the guarantor, and the witnesses all draw their fingerjoints below their names to indicate their acceptance of the terms.

Typical Contract Terms

Only the affidavits and the judge's decision have survived, not the original contract. But we can reconstruct what typical contracts might have looked like on the basis of other contracts excavated from the Astana graveyard. Of the 250 contracts excavated from Turfan, more than 40 are loan agreements.[17] Most loans were for small sums, such as a few pecks of grain, several bolts of silk, or between 2 and 40 silver coins. One agreement dated 661 covers a loan of 30 bolts of silk from a money lender named Zuo Chongxi to a man named Long Huinu. After giving the date, this contract reads

> Long Huinu, resident of Anxi canton, receives thirty bolts of bleached silk from Zuo Chongxi, resident of Chonghua canton. The monthly interest will be four bolts of bleached silk. If the interest is not paid monthly, a fine of one bolt of bleached silk will be paid to Zuo each month. If Zuo needs the silk on a given day, then it must be returned to him promptly. If the borrower absconds, then it is up to his wife and children and those whose names follow below to redeem his debt.
>
> Officials have government law, and common people follow private contracts. The two sides agree to make this contract, and they draw their finger joints as a sign of good faith.
>
> Zuo, the owner of the silk, Zuo [no finger joint marks]
> Long, the person who receives the silk [finger joint marks]
> Guarantor Long Xu [finger joint marks]
> Witness Wei Zuo [finger joint marks]
> Witness Fan Shide [finger joint marks]
> Guarantor Kang Wenxi [finger joint marks][18]

All parties to the agreement drew their finger joints, except for the lender Zuo. They drew lines next to each joint of their index finger, an act equivalent to signing with an X in the West.

Many Turfan contracts follow the same format and include the same phrases. The identity of the guarantors is unknown, but two of the witnesses, both Sogdian merchants resident in Changan, later testified on Rokhshan's behalf, so the agreement had at least four participants: the borrower, the lender, and two witnesses.

The monthly interest of 13.33 percent, or four bolts on a loan of thirty bolts, stands out as unusually high. In the Silk Road case, we can assume that Yam-yān would have charged Merchant Li a lower rate of interest since Li was borrowing a larger amount of silk, but otherwise the missing contract would have followed this format.

A monthy interest rate on private loans of 6 percent (raised to 7 percent in 742) was stipulated by the Tang statutes, as reconstructed by Niida Noboru.[19] This was less than the prevailing rate in the surviving Turfan contracts, which usually call for 10 percent each month and sometimes more, as we saw in the contract above.[20] The state did not require registration of contracts for loans, but it did require contracts for the sale of livestock and slaves to be registered with market officials. The government's penal code, the *Tang Code*, also contains a few provisions about contracts. One limits the total interest charged to the value of the principal.[21] The terms of the Turfan contracts, except for interest rates, are fully consonant with prevailing Tang legal regulations.

Had the Silk Road case been governed by Iranian law, Merchant Li should have given

something, whether property, slaves, or goods, as security when he borrowed 275 bolts from Rokhshan. Iranian judges emphasized the lender's obligation to maintain the property or goods provided by the borrower as security on a loan. When Merchant Li and Rokhshan drew up their contract in 670, Turfan had already been under Tang rule for thirty years, so it seems unlikely that the contracting parties would also have drawn up a Sogdian-language version of the contract.

Other extant documents from Turfan are in Chinese but have Sogdian signatories. Some Sogdians, particularly those born in Turfan, must have spoken good Chinese and been able to read it. For those who, like Yam-yān, did not, the Chinese courts provided interpreters.[22]

The Value of Silk

The dispute between Cao and Li reveals much about silk prices. Most of the silk traded along the Silk Road during the Tang dynasty was not multicolored luxury silk but plain white silk, a common medium of exchange. Silk, bronze coins, and silver specie were the three main types of currency in circulation in the Tang.

Silk circulated mainly in the form of bolts, woven to a standard length of forty feet and a width of one foot eight inches.[23] Silk's value fluctuated less than that of the bronze coins, whose weight also made them inconvenient. One string, or one thousand coins, weighed as much as four kilograms.[24] In the seventh century silver coins, minted by the Sasanian empire and, after 651, by their Islamic successors, circulated widely throughout western China. For reasons not yet understood, the people of Turfan stopped using Iranian coins after the year 700 and began to use Tang bronze coins instead.[25]

The Tang government collected taxes in kind, requiring households to pay in labor, cloth (often silk), and grain, according to each household's assessed annual obligation. In the mid-eighth century, the government's annual tax receipts included 27 million bolts of cloth, 250 million pecks of grain, and only two million strings of coins, a clear indication of silk's importance as a medium of exchange.[26]

What was the value in 670 of 275 bolts of silk? No reliable price tables exist, but contemporary contracts from Turfan provide a rough sense of silk's purchasing power. In 673 a camel cost forty bolts of silk, and in 731 an eleven-year-old female slave commanded the same price. The loan of 275 bolts probably sufficed for Merchant Li to buy a load of goods and maybe some animals to carry it, but it was a small transaction in contrast to the government's regular expenditures. A single garrison in Dunhuang in 745 cost the central government an annual subsidy of 15,000 bolts of silk.[27] Most of this was for salaries for soldiers and officials, who then spent their money in local markets, purchasing goods from merchants like Li and Yam-yān.

Conclusion

The dispute between Cao and Li over 275 bolts of silk is but a single example that survives because of extraordinary circumstances. Even so, it reveals much about the conditions facilitating Silk Road trade. Scholars of European history, Avner Greif among them,[28] have devoted much energy to reconstructing the various institutions in Europe during the eleventh, twelfth, and thirteenth centuries that facilitated long-distance trade. Coalitions among merchants, courts at annual fairs, and an unwritten merchants' law all played an important role in creating an environment that encouraged merchants to invest money in long-distance ventures with other merchants they did not know personally.

Most people, whether in China or the West, do not think of traditional China as having an active legal system. Yet the dispute between Merchant Li and Rokhshan demonstrates the willingness of the traditional Chinese courts to intervene in a private dispute, a willingness well-documented by a series of secondary studies published in recent years.[29]

This judge accepted a case in which there was no written contract, and in which three of the four parties involved were not Chinese, suggesting that Tang judges were willing to adjudicate almost any dispute. Like their counterparts in Europe, merchants in China required some reassurance before they would do business with or extend credit to someone they did not know personally. At the time of their partnership, Merchant Li and Yam-yān did not even share a common tongue. The readiness of the Turfan judge to hear Rokhshan's case on behalf of his deceased brother illustrates the extent to which the Tang legal system supported the enforceability of contracts, even of private oral agreements. No wonder so many merchants chose to engage in long-distance trade on the Silk Road.

PART II:
RECORDS FROM A SEVENTH-CENTURY PAWNSHOP IN CHINA

VALERIE HANSEN AND ANA MATA-FINK

Hardly any business records from China survive from before the nineteenth century. Imagine, then, the amazement of the Chinese archeologists who found pages from a seventh-century account book of a pawnshop. Written in Changan, the capital of the Tang dynasty (618–907), the pages from the account book made the twelve-hundred-mile journey to Turfan in the arms of a tomb figurine, which was buried in the Astana graveyard in northwest China.[30] The fifteen sheets of paper, which record some fifty-four transactions (the last sixteen are in fragments), are the earliest recorded examples of pawnshop loans yet found in China.[31] Although sparse, the information they provide permits us both to reconstruct the workings of a single pawnshop and to sketch some broader conclusions about credit and interest rates in traditional China.

The Account Book

Each entry is devoted to a single transaction and follows a fixed format: item pawned, name of borrower, date, amount of money loaned, date the money was returned, address of borrower, and occasionally his or her age. The staff of the pawnshop recorded the loans on pieces of paper ranging between ten and twelve inches high and six or seven inches wide. Once the pawned item was returned, the staff crossed out the returned item with a bold mark in the shape of a seven. They then discarded the paper (unusually, with writing on just one face), probably by selling it to a used paper vendor, who must then have sold it to the workshop that made the tomb figurines.

Pawned items were usually clothing or pieces of cloth (see appendix for translation of the tickets). The account book names the specific article of clothing and gives its condition, color, and fabric. Almost all the items of clothing are called "old," sometimes even "tattered," but we should view these designations with skepticism: pawnshop clerks labeled almost everything pejoratively in order to assign the lowest possible value.[32] Only two transactions involved other goods: Borrower 26 received 150 coins against four strings of pearls, and Borrower 12 collected 70 coins for a bronze mirror.

There is no obvious correlation between the items pawned and the money received: Borrowers 2, 6, and 28 received between 40 and 100 coins for a single shirt. The single largest transaction was for 1,800 coins: Borrower 19 put up five items (two skirts, an overgarment, a scarf, and one other garment) to obtain this large loan, but none of the other borrowers received more than 200 coins for any individual article of clothing. The amount of the loans ranges from 20 to 1,800 coins, with an average of 172.5 coins. If we leave the largest loan of 1,800 coins out of our calculation, the amount loaned is approximately 116 coins per transaction.

Price data from this period is scarce, but the official histories record that in 665, a year with a good harvest, one could buy a peck, or approximately 5.5 quarts, of rice for five coins. (A very rough estimate in today's prices would put the cost for the same amount of rice at $10.) Most records of government expenditures use one thousand coins, or a string, as the unit of reckoning, with but a single recorded loan exceeding a single string.

Only two of the entries mention interest. Most entries simply note that the loan was repaid, without recording the amount of interest paid. In the two exceptions, the borrowers made initial payments toward their debt, which required the bookkeeper to distinguish

Sample entries from the Changan pawnshop records, ca. 662–689 A.D.
Four sample pawnshop loan records. The horizontal and diagonal strokes indicate that the loans were paid off and the pawned items retrieved. The red character on the bottom of the far left line reads "here," an indication that the torn white silk garment of a child was placed in the shop—and not in another storage-place—when pawned.

between repayment of principal and interest payment. For example, in Transaction 25, Cui Ji borrowed 100 coins on the nineteenth day of the first month; four and one-half months later he made a partial payment of 49 coins, of which 40 went toward the principle. The 9 coins toward interest works out to an interest rate of 5 percent a month. Borrower 28 paid the same interest rate on the money he borrowed, so it seems likely that the other borrowers paid an equal rate. During the Tang dynasty (618–907), government offices were permitted to make loans at 5 percent a month.[33]

The age of the borrowers ranges from fifteen to sixty, with the average twenty-eight years old.[34] Interestingly, borrowers under thirty tended to borrow more money (averaging 365 coins each—or 160 if the loan of 1,800 coins is excluded) than those over thirty (averaging 92 coins each). The small amount of the loans suggests that the borrowers were ordinary city dwellers, an impression confirmed by the two borrowers whose occupation is given. Borrower 24 belonged to a dyer's household; Borrower 29 was a hairpin master.

Of the twenty-nine borrowers whose names are recorded, nineteen had distinctly male names and ten female names. Men are called by their surname and given name. With two exceptions, the family names are those used by Chinese; Cao and He were among the surnames assigned to Sogdians from the region of Samarkand, and the two men might have been Sogdian.

The women have surnames but no given names. Instead they are referred to by their position within the family: "woman" (*niang*), "old woman" (*po*), or "younger sister" (*mei*). Evidence from central Asia in this period reveals that women often borrowed money, sometimes against pledges; Professor Deng Xiaonan of Peking University suggests that husbands may have sent their wives, and sometimes their children, to pawnshops and moneylenders to spare themselves embarrassment.[35]

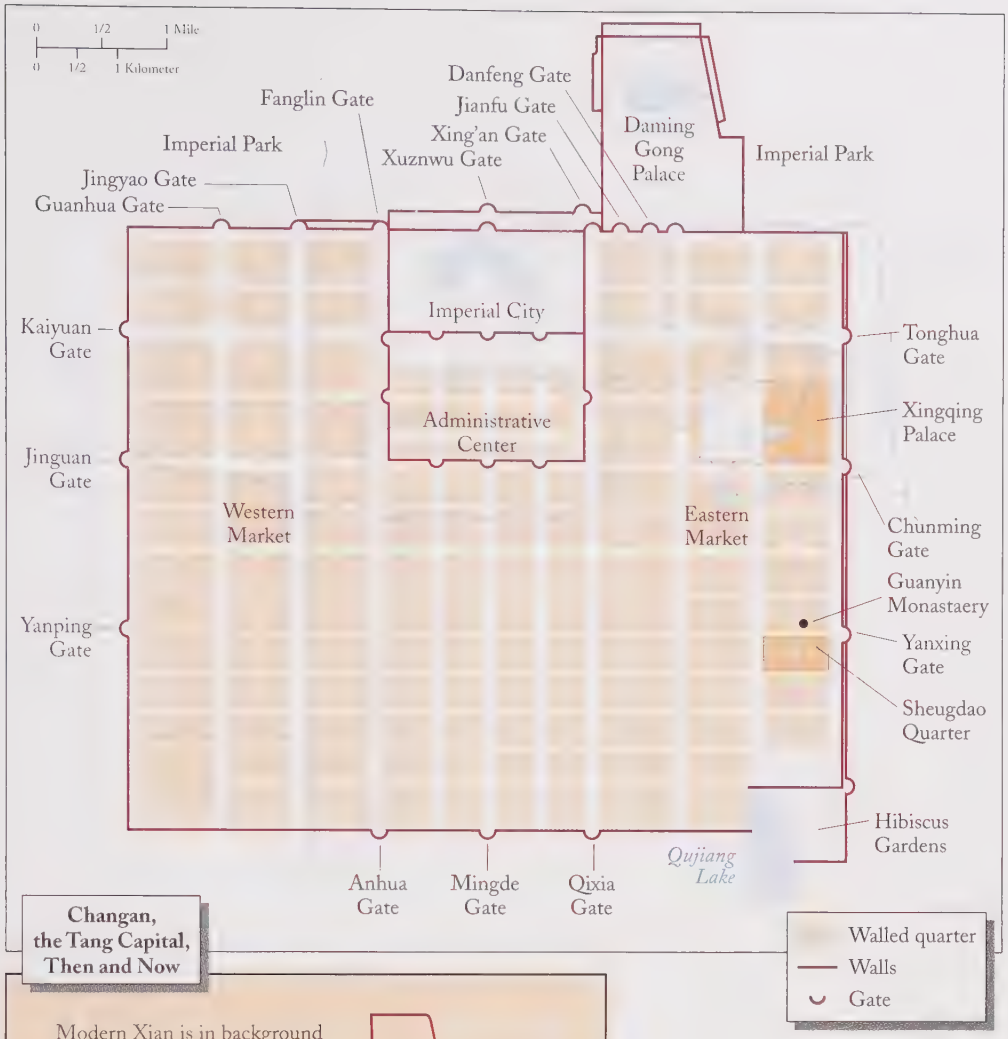
Slight variations occur among the entries. A few have a character or two written in red. These say "here" or "in the outer storage area" or "in the light storage area," indicating where items were stored in the shop.[36] Most of the entries carry no mark indicating the consent of the borrower, but the ledgers of Borrowers 23 and 33 have finger joint marks. (As was the custom in Tang-dynasty China, the borrower usually drew three lines next to the joints in the right index finger, a sign that he or she accepted the terms of the loan.) Five other transactions carry the signatures of Borrowers 1, 9, 13, 19, and 25. All but one of these transactions was for more than 100 coins, so the pawnshop employees may have required borrowers to sign before giving out larger loans.

The Date and Provenance of the Materials

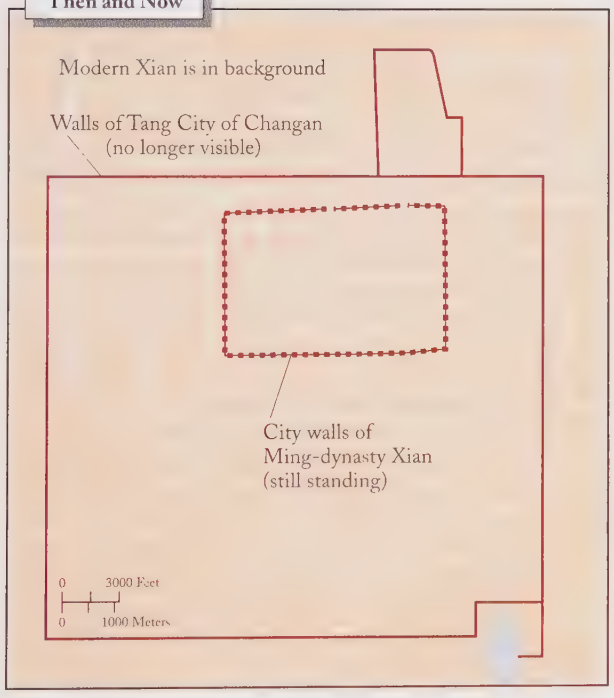
The pawnshop accounts bear no date and no address, but the information from the other documents and artifacts in tomb 206 makes it possible to date them to the late seventh century and to identify their city of origin as Changan.

When, in 1973, the archeologists first excavated the tomb that produced the figurines, they immediately noticed that some figurines were crudely manufactured while others were of very high quality. They suspected that the unpainted figurines were made locally in Turfan, while those with painted faces came from a metropolitan center. The tomb had been opened twice: once, in 633, when the husband Zhang Xiong had died, and a second time, in 689, when his wife Lady Qu was buried next to him.

Both husband and wife had dated epitaphs. A prominent statesman from a powerful family, Zhang advocated that the Gaochang king cooperate with the Tang dynasty and accept tributary status. The king refused his counsel, and, at the time of his death, Zhang



Changan, the Tang Capital, Then and Now


Modern Xian is in background
Walls of Tang City of Changan (no longer visible)
City walls of Ming-dynasty Xian (still standing)
0 3000 Feet
0 1000 Meters

had a simple funeral. In 640 Tang troops conquered Gaochang. By 689, the year of Lady Qu's death, Zhang Xiong's stature had risen considerably. His wife was given a lavish burial suitable for the spouse of a prescient statesman.

While the rougher wooden items dated to 633, Turfan archeologists surmised, most of the high-quality artifacts in the tomb date to Lady Qu's burial in 689. These figurines have painted faces typical of manufacture in the capital. In addition, the dancer's dress is made from an extremely high-quality silk that skillfully incorporates the Iranian pearl roundel motif. The sophistication of the figurines suggests that they were manufactured in Changan and then shipped to Turfan for Lady Qu's burial.[37]

The pawnshop account book confirms the view of the archeologists that the higher quality items buried in 689 were manufactured in Changan. Several of the entries give the addresses of the borrowers: Yanxing gate, Guanyin monastery, and possibly Shengdao quarter.[38] Places with these names did not exist in Turfan, but these three places were located close to each other in Tang-dynasty Changan. Yanxing gate was the southernmost gate on the east wall. When one entered the city through that gate, Shengdao quarter lay to the south, and the Guanyin monastery, named for Guanyin, the Buddhist deity of compassion, immediately to the north. Changan had a monastery by that name only between 662 and 711, so the earliest possible date for the account book is 662.[39]

The tomb was closed for the second time when Lady Qu was buried, so we can conclude that the account book was composed in Changan between 662 and 689.

Tomb figurine from Lady Qu's burial. Astana Graveyard, Turfan, China. Pottery, silk and paper. Seventh century, A.D. Manufactured in Changan, the capital of Tang Dynasty China, and shipped to Northwest China for use as a funerary offering. The arms of this figurine were made from reused scraps of paper pawnshop tickets.

The Origins of Chinese Pawnshops

The Turfan account book dates to the late seventh century, while the earliest literary evidence of pawnshops, whether in the official histories or in contemporary fiction, dates to the fifth century, when a prince pawned a fur cushion, and an ordinary man pawned a bolt of cloth. Pawnshops appear to be have been relatively common by the seventh century, when a princess supplemented her income by running a pawnshop in addition to owning farms.[40]

The rise and spread of pawnshops coincides with the introduction of Buddhism to China, and indeed the first pawnshops were located in Chinese monasteries.[41] The concept of a loan against a pledge may have originated in India.[42] As L. S. Yang, the author of the classic study about pawnshops, has noted, the monasteries did not charge interest, because the loans were a form of charity that produced merit both for the monastery and its donors. The monasteries probably did not even write out tickets, because borrowers always paid them back "for fear of divine retribution."[43]

The direct ancestor of modern banks, the monte di pietà (literally "mount of piety") of Italy, provides an interesting parallel. In 1462, the Franciscans founded these pawnshops in Italy with the explicit goal of giving ordinary people an alternative to usurers, many of whom were Jewish moneylenders. Members of the Franciscan order solicited contributions from the wealthy by arguing that a single contribution to the monte di pietà did as much good as seven separate contributions for the different needs of the poor. Like Chinese monasteries, they initially did not charge interest.[44]

Since nonmonastic pawnshops did not have the same advantages as monastic pawnshops in China, historians have always assumed they must have charged interest. For this reason it seems likely that the pawnshop of the extant account book was privately run, though located in the vicinity of the Guanyin monastery.

Conclusion

The significance of Chinese pawnshops should be obvious. During the Tang dynasty they provided credit to all levels of society from the poorest to the richest, and they continued to do so in later centuries. As in Europe, pawnshops were a forerunner to banks, and borrowers could, through repeated transactions, obtain large loans against relatively small amounts of collateral. "In the middle of the eighteenth century," L. S. Yang remarks, "pawnshops almost functioned as commercial banks because they made loans on commodities like grain, silk, and cotton."[45] The origins of Chinese pawnshops lay in Buddhist monasteries, and they remind us that the innovation of making a loan against a pledge was not unique to the Western world.

Appendix: A Record Book of Accounts from a Tang Dynasty Pawnshop

1. One zhang four chi [approximately 4.25m] of plain silk
   Wei Tong on the eighteenth day of the first month of the lunar year received 120 coins *Wei Tong's signature*
   Redeemed, the twenty-fourth day of the same month
   West gate, big lane fifty years old
2. One old yellow cloth shirt
   Woman Yin on the eighteenth day of the first month of the lunar year received 50 coins
   On the same day received another 50 coins
   Redeemed, the twenty-third day of the same month
   South ward Wife of Hou Shenbao
3. [gap in text] One lined silk jacket [gap in text]
   He Sizhong on the eighteenth day of the first month of the lunar year received [gap in text]
   Redeemed, the fifteenth day of the second month of the lunar year
   North alley [gap in text]
4. A three-year-old child's damaged white plain silk [gap in text]
   Here [in red ink]
   Zhi Cai on the eighteenth day of the first month of the lunar year [gap in text]
   Redeemed, the twenty-seventh day of the ninth month of the lunar year
   [gap in text]
5. One old white silk scarf with pattern of small damasked diamonds
   Yang Erniang [second daughter?] on the eighteenth day of the first month of the lunar year received 20 coins
   Redeemed, the seventh day of the second month of the lunar year
   Lives in North alley thirty-six years old
6. One old white cloth shirt
   Zhang Yuanshuang on the eighteenth day of the first month of the lunar year received 100 coins
   South ward, Hairpin [gap in text]
7. One old white cloth kerchief
   [gap in text]
8. One [gap in text] small shirt with pattern of damasked diamonds
   [missing surname] Asi on the eighteenth day of the first month of the lunar year received 50 coins
   Redeemed, the nineteenth day of the same month
   Hanzi [crossed out character] Ye
9. One small purple woman's cape with pattern of damasked diamonds
   Li Siqing on the eighteenth day of the first month received 120 coins
   Redeemed, the tenth day of the second month of the lunar year, given to the younger brother Sitai
10. [gap in text]
    He Qiniang [seventh daughter?] on the eighteenth day of the first month of the lunar year received 120 coins
    Redeemed, on the first day of the second month of the lunar year, given to the mother Mi, who took it away
    Alley behind Guanyin Monastery [gap in text] years old

11. [gap in text]
    Lives at the top of Bo mountain eight[teen] years old
12. One small old thin shirt with pattern of damasked diamonds One bronze mirror
    Here [in red ink]
    Ma Siniang [fourth daughter?] on the nineteenth day of the first month of the lunar year received 45 coins
    On the twenty-eighth day of the tenth month of the lunar year presented a modern mirror in exchange for another 70 coins
    Redeemed, the seventeenth day of the eleventh month of the lunar year and the mirror was taken away
13. [gap in text] Jiashu on the nineteenth day of the first month of the lunar year received 50 coins *Shu's signature*
    Redeemed, the sixth day of the third month of the lunar year
    Lives in East head eighteen years old
14. Four liang [approximately 150 grams] of green thread Damaged yellow coarse silk lining
    Woman Liu on the nineteenth day of the first month of the lunar year received 100 coins
    Redeemed, the twenty-seventh day of the second month of the lunar year
    Lives above the shop outside Yanxing gate forty-two years old
15. One small old lined purple-red skirt tie-dyed with small patterns [probably polka-dot like circles]
    Wang Xuanjing on the nineteenth day of the first month of the lunar year received 150 coins
    Redeemed, the twenty-second day of the second month of the lunar year
    Lives in Wang Xie Village fifteen years old
16. One old white cloth shirt
    One [gap in text] shirt
    He Shangang on the nineteenth day of the first month of the lunar year received 100 coins
    Redeemed, the twenty-fifth day of the same month
    Lives at the head [gap in text] twenty years old
17. [gap in text]
    Zhang Yuanshuang on the nineteenth day of the first month of the lunar year received 30 [coins]
    The same day received another 10 coins
    Redeemed, the sixteenth day of the eighth month of the lunar year. The items were paid to Cang Taoren, who took them away
    South ward, Hairpin
18. One old white cloth skirt One white felt rug replaced the skirt, which was taken away
    Cao Ajin on the nineteenth day of the first month of the lunar year received 100 [coins]
    The ninth day of the second month of the lunar year received another 150 coins paid to his mother
    Redeemed, the tenth day of the second month of the lunar year
    Lives on North alley one [missing digit] years old
19. One small old emerald lined overgarment with pattern of damasked diamonds Small old blue lined skirt with pattern of damasked diamonds

One small old red lined skirt with pattern of damasked diamonds Old plain green [gap in text]
One frayed lining of a man's black headdress [probably worn by a Chinese official]
Song Shoutian on the nineteenth day of the first month of the lunar year received one thousand eight [hundred] coins *Tian's signature*
Redeemed, the fourth day of the second month, given to [gap in text]
South ward, West market nineteen years old

20. Shengdao [ward]
21. One pair of old ragged sandals
In the outer storage area [in red ink]
Woman Yang on the nineteenth day of the first month of the lunar year received 100 [gap in text]
Redeemed, the seventh day of the twelfth month of the lunar year
Woman Yang Lao lives in [gap in text]
22. One small old white lined trousers with pattern of damasked diamonds
[rest of record is missing]
23. One tattered white cloth shirt
Liu Yuanhuo on the nineteenth day of the first month of the lunar year received 30 coins
Redeemed, the twentieth day of the same month by Liu's younger brother received the shirt who took the shirt away
Lives in South ward 23 years old [joint marks]
24. Seven feet five inches [approximately 2.5 meters] of white bleached silk
Yang Jin'gang on the nineteenth day of the first month of the lunar year received 80 coins
Redeemed, the twenty-sixth day of the fourth month of the lunar calendar
Dyer's family, East head
25. One old red silk gauze scarf 2 feet [approximately 60 centimeters] of old white bleached silk
Cui Jin on the nineteenth day of the first month of the lunar year received 100 coins
The seventh day of the sixth month of the lunar year paid 40 coins toward the principal and 9 coins in interest. The silk was given to Cui who took it away
Redeemed, the eighteenth day of the seventh month of the lunar year
Lives in East head twenty years old
26. Four strings of delicate pearls with approximately 400 pearls
Li Yuanfeng on the nineteenth day of the first month of the lunar year received 150 coins *Yuan's signature*
The twelfth day of the third month paid 120 [coins] toward the principal
[gap in text]
27. [gap in text]
Old Woman Niu on the twentieth day of the first month of the lunar year received 60 coins
Redeemed, the eighth day of the third month of the lunar year
Lives in East head sixty years old
28. One old damaged white plain silk shirt Damaged plain unlined green skirt replaced the shirt, which was taken away
Wang Shuai on the twentieth day of the first month of the lunar year received 40 coins

The tenth day of the fourth month of the lunar year paid 15 coins toward the principal and 2 coins in interest and [gap in text] was taken away
Redeemed, the eleventh day of the fourth month of the lunar year
Lives in North alley [gap in text] years old

29. [gap in text]
Zhang Yuanliang on the twentieth day of the first month of the lunar year received 220 coins
Redeemed, the twenty-fifth day of the same month
South ward, hairpin master

30. [gap in text] twenty-first day [gap in text]

31. In the light storage area [in red ink]
One white bleached silk undershirt One old red coarse silk quilt cover replaced the undershirt, which was taken away
[gap in text] younger sister on the twenty-first day of the first month of the lunar year received 200 coins
The fifth day of [gap in text] month of the lunar year received another 20 coins The eleventh day of third month of the lunar year received another 130 coins
Redeemed, the sixth day [gap in text]
Top of Bo mountain, north of the western wall

32. [gap in text] 14[0 coins]
Redeemed, the twenty-sixth day of the [gap in text] month of the lunar year
Lives in North alley 20 years old

33. One old green coarse silk unlined skirt
Wang Yuanren on the twenty-fourth day of the first month of the lunar year received 160 coins
Redeemed, the fourth day of the sixth month of the lunar year [joint marks]
Xun Family Mouth, Xiao Wang Village 40 years old

34. Two pair of hemp sandals
Dong Yuan on the thirtieth day of the first month of the lunar year received 60 coins
Redeemed, the second day of the second month of the lunar year
[Lives in North alley]

35. [gap in text] alley Ge family
[gap in text] one shirt replaces one old green plain silk skirt, which was taken away
[gap in text] on the nineteenth day of the [gap in text] month of the lunar year received 100 coins
Redeemed [gap in text] fourth day
[gap in text] Changzi West ward [missing digit]7 [years old]

36. Redeemed [gap in text]
South ward, Hairpin
One [gap in text] silk skirt
[gap in text] day received 15[0 coins]

37. Lives in [Sheng]dao ward

38. [gap in text]
[gap in text] 300 coins
principal
Lives in [gap in text] twenty-four years old

39. [gap in text] child who buys [sells?] small cakes

40. Plain silk green lined skirt
41. Cheng [a family name]
42. One old [gap in text] cloth shirt
43. One small old purple lined skirt with pattern of damasked diamonds Old yellow cloth shirt
44. Deng Shanren
    Redeemed, the twenty-sixth day of the same month
45. The twenty-first day of the fourth month [gap in text]
46. On eighteenth day of the [gap in text] month of the lunar year received 30 coins
47. The same day promptly received another 100 coins
48. Redeemed, the fourth day of the same month
49. Redeemed, the twentieth day of the same month
50. Redeemed, the twenty-second day of the same month
51. Redeemed, the twenty-fifth day of the same month
    Lives in West head [gap in text] years old
52. Eighteenth day
    Lu
53. 20
    coins
    Received 5 coins
54. Damaged
    additional
    north

4

The Origins of Paper Money in China

RICHARD VON GLAHN

China's heritage of coining money is as venerable as that of the Mediterranean world. By the time the first unified empire was founded in late third century B.C., use of money had become fundamental to Chinese economic life. Yet from ancient times the monetary system of China diverged substantially from the traditions of the Mediterranean region and west Asia. In the West, monetary standards were based on precious metals. Silver coin predominated within domestic trade, but gold coin prevailed as the monetary standard of international trade. The high and stable value of gold across time and space endowed it with enormous symbolic power as a measure of value invulnerable to manipulation by any state or ruler. Even today the notion of a "gold standard" connotes a stability of real value that transcends dollars, euros, yen, or any state-issued currency. In China, the monetary system of the imperial era was based not on precious metals but on bronze coin. In Western thought, money made from base metals like copper (or even silver) was seen as readily susceptible to fiscal chicanery at the hands of administrators who constantly sought to debase their coins, trying to circulate them at a nominal value greater than their substantive worth. Bronze coin was regarded as a primitive form of money and its low unit value testified to the lack of commercial development within the economy. Yet despite an enduring allegiance to a bronze coin monetary standard,

China also developed the world's first viable paper currencies. In the eyes of Western economists, both the durability of a base metal currency and the precocious development of paper money attest to the overriding dominance of the state in the Chinese economy. Both bronze coin and paper money served as fiat currencies whose value was determined by a state that exercised extraordinary control over its national economy.

For those who imagine the evolution of monetary systems as a linear progression from primitive commodity monies to gold and silver coinage and finally to purely nominal currencies like paper money, the early appearance of paper money in China in the eleventh century appears to be a glaring anomaly. Yet classical Chinese monetary theory gave ample endorsement to the use of fiat currencies like paper money. In contrast to Western monetary thought, which addressed the problem of determining a just price for commodities exchanged in market transactions, Chinese monetary thought and policy was predicated on enabling the ruler to overcome the vicissitudes of dearth and plenty and to provide for the material needs of his subjects. The ruler could accomplish this goal by tightly controlling the supply of money to ensure stable prices and ample supplies of goods. The Aristotelian tradition, which dominated Western economic thought down to early modern times, believed that the value of the substances used as money derived from their exchange values as commodities. Thus gold and silver currencies had values directly proportional to the intrinsic values of these metals as commodities. Such a conception of money had little tolerance for fiat currencies.

Chinese philosophers and statesmen, in contrast, have universally asserted that money is an artifact of the supreme ruling authority. It is the ruler's stamp, not the intrinsic value of the monetary medium, that confers value. The origin of money was attributed to ancient sage-kings who used it to facilitate exchange for the purpose of relieving famine. In order for the ruler to fulfill this role, however, it is essential that the ruler alone control the supply of money. Although gold currency was used in ancient China, from the inception of the imperial era successive Chinese dynasties utilized not precious metals but rather much cheaper bronze or brass alloys to mint coin. The rarity of gold and silver inhibited the ruler's ability to create money as needed. Copper, a far more abundant metal, was more directly amenable to the ruler's control, enabling the state to increase the quantity of money in proportion to the needs of its subjects. At least that was the theory. In reality, successive dynasties throughout the imperial era were plagued by shortages of bronze coin.

Bronze coin thus served as the monetary standard of imperial China, and units of bronze currency were used to express values and prices. Coins were counted by tale rather than issued in different denominations, and the basic monetary unit was the single coin (*wen* or "cash"). Larger units were created by stringing coins together in units of 100 (*mo*) and 1,000 (*guan*) coins. The *guan* (or "string of cash") became the standard unit of account in state finance. But the *guan* did not always contain 1,000 coins. During the Tang (618–907) and Song (960–1276) dynasties, which suffered from severe shortages of coin, the *guan* often contained far fewer coins but was still rated as equivalent to a full string of 1,000 coins. The Song government established an official "short-string" standard of 770 coins per *guan*, though a variety of different standards were used in private exchange. When paper money was introduced during the Song dynasty, it was denominated according to the "short-string" standard of 770 coins per *guan*. Later, during the Mongol-ruled Yuan dynasty (1272–1368), weights of silver were also used to denominate paper money.

The story of paper money in China begins with the reunification of the empire by the Song dynasty in the late tenth century. Following the fall of the Tang dynasty in the early

years of the tenth century, China was divided into nearly a dozen regional kingdoms. Despite this political fragmentation, the states in the south and west enjoyed buoyant prosperity, in part fueled by the flood of immigrants from the war-torn north who swelled the labor force and tax base. Interregional trade flourished, but as during the Tang dynasty shortages of hard currency hindered commercial growth. Fearing that foreign trade threatened to deprive them of already scarce currency reserves, rulers resorted to debasing their coin to render it less attractive to speculators. Moreover, most states lacked copper mines and were unable to generate significant amounts of new bronze coin. Instead, they minted coins using cheaper metals like iron and lead. These cheap coins had the added advantage of being virtually worthless beyond the state's own frontiers, and therefore ensured a secure money supply for the domestic market.

The western region of Sichuan, under the rule of the kingdom of Shu during these years, typified the pattern of monetary autarky. Sichuan's geography reinforced its economic isolation. The heart of Sichuan was a large basin, once an ancient inland sea, encircled by mountain ranges that walled off the region from the rest of the empire. Thus insulated from the civil wars and political strife that beset the Tang empire after the mid-eighth century, Sichuan underwent an economic boom during the ninth and tenth centuries, boosted by the region's fine silk cloth and burgeoning tea industries. The Shu kingdom inherited this prosperity and also enjoyed relative monetary stability compared to its rivals, until the mid-950s when rising defense costs forced its ruler to mint iron currency to supplement its limited supply of bronze coin, creating a dual currency system using both iron and bronze coins.

The Song dynasty, founded in North China in 960, gradually conquered and absorbed the southern and western kingdoms (including Shu, in 965) into its empire over the next two decades. The Song originally intended to reestablish throughout its empire a single monetary system based on full-bodied bronze coin. As a temporary expedient, though, the court preserved the existing iron currency system in Sichuan, where iron coins had driven bronze coins out of the marketplace. In 979, the Song launched a plan to restore bronze currency to Sichuan by requiring that 10 percent of taxes be paid in bronze coin, an amount that was to increase an additional 10 percent each year over the following ten years, at which time iron coin would be discarded. Because of the scarcity of bronze coin in the region, however, the new policy sparked a panic among taxpayers desperate to obtain bronze coins for tax payments. Within a year the value of iron coins plunged by 40 percent. Three years later the government conceded that the plan was failing and abandoned it. Instead, fiscal policymakers resigned themselves to the practical necessity of maintaining a separate iron currency zone in Sichuan. Merchants engaged in interregional commerce had to surrender iron coins and exchange them for bronze currency upon departing Sichuan. Sichuan's mints exclusively manufactured iron coins based on the old Shu kingdom standard.

Sichuan's iron currency suffered from serious deficiencies. The low intrinsic value of iron coins, worth no more than a tenth of the equivalent amount of bronze coin, imposed a great burden on merchants who needed to convey their purchasing capital from one place to another, and on ordinary consumers as well. A housewife would have to bring a pound and a half of iron coin to the marketplace to buy a pound of salt, and a merchant from the capital would receive ninety-one and a quarter pounds of iron coin in exchange for an ounce of silver. Of course, the inconvenience of transporting low-value coin afflicted bronze currency as well. In the early ninth century, the Tang government created depositories at its capital of Chang'an where merchants could deposit bronze coin in re-

turn for promissory notes (known as *feiqian*, or "flying cash") that could be redeemed in provincial capitals. "Flying cash" was especially popular among tea merchants who wished to return their profits from the sale of tea in the capital to the distant tea-growing areas of southeastern China. The Song dynasty continued this practice under the rubric of "convenient cash" (*bianqian*), accepting payments of gold, silver, coin, or silk in return for notes denominated in bronze coin.

In the mid-990s, Sichuan's iron currency system suffered a severe crisis. An insurrection against Song rule broke out in Sichuan in 993, fueled in part by the relentless depreciation of iron currency. The rebels succeeded in capturing Chengdu, the capital of Sichuan, and held the city until June of 994. The rebellion forced the closure of Sichuan's mints, which remained shut even after the imperial government regained control of the region. The ensuing shortage of coin, in combination with the inconvenience of transporting bulky iron coin, prompted some merchants to begin issuing their own paper bills, which people began to use as currency in private trade. The few documents concerning these private bills at our disposal do not reveal their exact nature, but it seems likely that they were issued in exchange for deposits of cash or other exchange media (gold, silver, and silk), much like the government-issued "convenient cash" notes.

Over the next ten years these privately issued "exchange bills" (*jiaozi*) gained a significant place in Sichuan's intraregional trade. Yet the proliferation of numerous sundry private bills, many issued by unscrupulous entrepreneurs, also resulted in widespread abuse and a surge of lawsuits. In 1005, the prefect of Chengdu, Zhang Yong, undertook a series of reforms aimed at stabilizing Sichuan's chaotic monetary situation. First, Zhang Yong secured the court's permission to reopen Sichuan's mints and at the same time introduce a large iron coin rated as equivalent to ten small iron coins or two small bronze coins. Second, Zhang subjected the *jiaozi* paper notes to government regulation. The right to issue *jiaozi* was restricted to a consortium of sixteen merchant houses in Chengdu deemed to have sufficient financial resources. Zhang mandated that the merchants issue *jiaozi* in standardized size, color, and format, though merchants also marked their notes with their own seals and "hidden" insignia (perhaps something like a watermark). The actual printing of the notes was done using labor and materials supplied by the prefectural government. As before, the *jiaozi* had no standard denomination. The issuer inscribed the value of the bill in ink on the note itself. The bills circulated freely as exchange media, and when a bearer wished to cash a note he was required to pay a commission fee of 3 percent. The government imposed no limits on the amount of *jiaozi* the designated merchants could issue. The quantity of bills in circulation followed the rhythms of seasonal demand, as issuers typically doubled their output of bills in early summer, when the new silk reached the market, and at the time of the rice harvest in the autumn.

Though greatly celebrated by his contemporaries, Zhang Yong's initiatives failed to resolve Sichuan's monetary troubles. The large iron coins, undervalued by the official tariff, quickly disappeared from circulation. Consequently, in 1014 the weight of the iron coins was reduced by half to bring their intrinsic value in line with their nominal value. The new, lighter iron coins quickly gained favor, and not surprisingly the small iron coins soon vanished. Henceforth the mints exclusively issued large iron coins, which became the new monetary standard in Sichuan. The 1014 readjustment of iron currency ushered in a period of monetary and price stability in Sichuan that lasted until the 1070s.

Zhang Yong's effort to regulate paper currency also encountered problems. The merchant houses authorized to issue *jiaozi* invested their cash deposits in commercial real estate, arable lands, and luxury commodities, leaving many of them without sufficient

liquidity to redeem the notes they issued. Counterfeiting also mushroomed, resulting in incessant legal squabbles, and some of the issuers shut their doors. In 1016, the fiscal intendant stationed in Chengdu, Xue Tian, proposed a government takeover of paper currency in Sichuan, but his recommendation went unheeded. Three years later, in 1019, *jiaozi* were being discounted by 20 or 30 percent, and the new prefect of Chengdu, Kou Qian, ordered a halt to the issue of new *jiaozi*, although current notes remained in circulation. After Kou Qian completed his tenure as prefect in 1023, however, he was succeeded by Xue Tian, who once again pushed for the government to assume administration of paper currency. This time Xue's proposal was accepted. A state-run *Jiaozi* Currency Bureau was established in Chengdu and given exclusive authority to issue *jiaozi*. The format of the new bills was modeled on the earlier private issues, but restricted to two fixed denominations (one and ten *guan*). The government also established terms of expiry for the new notes, which could circulate for two years before they had to be redeemed (at the cost of the 3 percent commission fee). The idea of limiting the time during which a bill could circulate served several purposes. It ensured that bills would be removed from circulation and destroyed before they became worn and tattered, and thus reduced the possibility of tampering or counterfeiting. In addition, the terms of expiry allowed the state to maintain firm control over the amount of paper money in circulation. The first issue of official *jiaozi* in 1024 amounted to 1,880,000 *guan*, but subsequently the biennial quota for each issue was fixed at 1,256,340 *guan*.[1] The *jiaozi* currency proved highly popular, especially with Sichuan tea merchants engaged in interregional and international commerce, and often traded at a premium over its nominal value.

The invention of paper money was propelled not only by these economic conditions and fiscal initiatives, but also by technological innovations in paper-making and printing. Hemp fiber had been the chief raw material for paper-making in China until the Tang dynasty, but the invention of printing sometime in the early Tang imposed new technical requirements. By the early Song period tree bark, most notably mulberry bark, displaced hemp fiber as the preeminent raw material for paper used in printing both books and ephemera like calendars and almanacs. Mulberry paper was prized for its superior durability and whiteness, and also because it was relatively inexpensive to produce. Already by the ninth century Sichuan had emerged as a center of printing and mulberry-paper manufacture (mulberry leaves are the favorite food of silkworms, and Sichuan, famous for the high quality of its silk goods, had abundant supplies of mulberry bark). Thus, by the beginning of the Song period the technology and raw materials for bookprinting were readily available in Sichuan for adaptation to use in currency printing. The major innovations in printing currency were the use of metal printing plates (in contrast to carved woodblocks used for printing books down to the nineteenth century) and the overlapping impressions in multiple colors. The large quantities involved in printing currency undoubtedly mandated the substitution of metal printing plates for woodblocks, which wore out relatively quickly. After the government took over the issue of *jiaozi* in 1024 both the manufacture of paper stock and the printing of the bills were entrusted to the *Jiaozi* Currency Bureau in Chengdu, though in the 1070s the paper manufacturing was delegated to a separate government workshop in the city's suburbs.

In addition to providing a convenient currency for merchants, *jiaozi* also played a role in the Song state's fiscal administration. Like most premodern states, the Song government devoted the vast majority of its resources to frontier defense and war. From the beginning the Song empire had to contend with two formidable rivals along its northern

frontier, the Khitan kingdom (which styled itself, in Chinese fashion, the Liao dynasty) in what is now Manchuria and northeastern China, and the Tangut kingdom of Xixia in the northwest. Although the Song forged a truce with the Khitan in 1005 at the cost of a humiliating peace treaty, the Tangut frontier remained tense. The Song stationed large garrisons along its northwestern frontier, mobilizing over a million soldiers during the 1040s when war broke out between the Song and the Xixia. Supplying the northwestern frontier—a rugged, mountainous region remote from the Song capital at Kaifeng, with little arable land and poor transport routes—became the chief priority of the Song fiscal administration. To encourage merchants to deliver vital supplies like grain, fodder, and textiles to the frontier garrisons, officials in charge of military logistics repaid them with promissory notes (known as *xianqian jiaoyin*, or "ready cash exchange drafts"), which spared the merchants the expense of transporting coin back to the capital. The *xianqian jiaoyin* notes could be redeemed for bronze coin in Kaifeng at the Monopoly Trade Bureau (*Juehuowu*), the agency that administered the state monopolies on valuable commodities like salt, tea, liquor, alum, and various imported exotic goods. Since the Monopoly Trade Bureau received its revenues in cash, it provided a ready source of funds for national defense, and also supplied the cash reserves to back government-issued notes. In addition to redeeming the *xianqian jiaoyin* notes issued by frontier officials, the Monopoly Trade Bureau early on also gained the authority to issue the "convenient cash" promissory notes (*bianqian*) and vouchers (known as *jiaoyin*, or "exchange drafts") for various government-regulated commodities. Under the commodity voucher system, merchants who delivered supplies to the frontier garrisons had the option of receiving payment in vouchers entitling them to purchase certain quantities of monopoly goods (chiefly salt and tea) and sell them within designated marketing regions. These commodity vouchers became the linchpin of the Song government's fiscal administration in the eleventh century.

In 1026, the government began using *xianqian jiaoyin* to compensate merchants who supplied the northwestern garrisons; the notes were redeemable in Sichuan for iron coin or *jiaozi* bills. Military expenditures soared following the outbreak of war with the Xixia in the 1040s, prompting the government to increase the amount of *jiaozi* it issued to defray some of these additional costs. In 1048, after the cessation of hostilities, the government opted for a new system of military procurement that relied on payment in commodity vouchers instead of Sichuan currencies. Merchants supplying the frontier armies could now receive payment in salt vouchers (*yanchao*) that enabled them to buy salt from the huge state-operated saltworks at Xiezhou in Shaanxi, which they could then sell in designated regions. The state monopsony on salt guaranteed lucrative profits, and salt vouchers themselves became negotiable instruments that merchants traded among each other. The salt vouchers largely displaced the use of Sichuan *jiaozi* in the northwestern frontier region, and not until the 1070s did the *jiaozi* again play a significant role in fiscal administration. At the same time the bills issued by the Monopoly Trade Bureau, particularly the coin-denominated *xianqian jiaoyin* but also the salt and other commodity vouchers, became negotiable instruments. The state officially sanctioned a secondary market in these bills by allowing licensed merchants at Kaifeng (numbering about a hundred in the 1040s) to buy and sell *jiaoyin*, which often traded at a premium. Originally the *xianqian jiaoyin* had no fixed denominations; instead, the issuing official inscribed the value on the note and affixed his seal. But over time (probably beginning in 1029, when the issue of *jiaoyin* was centralized in the hands of the capital's Monopoly Trade Bureau) the government issued *jiaoyin* in standard denominations, which facilitated their circulation in private exchange.

In 1069, the political evolution of the Song dynasty took a wrenching turn. A pair of visionaries, the newly enthroned Emperor Shenzong (r. 1068–1085) and his prime minister Wang Anshi (1021–1086), launched a bold series of institutional, economic, and educational reforms aimed at nothing less than a total transformation of both state and society. In their view, resolving the intractable evils of invasion from abroad and worsening inequality at home required a renaissance, a rejuvenation of society in the robust image of hallowed antiquity, when the ruler's benevolent touch reached every corner of the realm. In the economic sphere Wang Anshi was determined to bring vital economic resources, including tea, salt, grain, and international trade, under the direct control of the central state. The fiscal innovations of Wang's "New Policies," such as cash loans to farmers and monetization of in-kind tax payments and labor services, were intended to free up productive energies and liberate peasants from the thrall of rentiers, usurers, and unscrupulous merchants. At the same time the New Policies drastically increased the demand for money. Wang sought to alleviate the pressure on the money supply by sharply escalating the output of bronze coin, which quadrupled to an average of more than five million strings per year in 1073–1084. In Sichuan, rather than minting more iron coin the government increased the money supply by simultaneously releasing two issues of *jiaozi*, in effect doubling the amount of paper currency in circulation. Although *jiaozi* in principle remained convertible with hard currency, in practice when old bills expired they were redeemed with new ones rather than repaid in coin. In concert with the increase in the quantity of *jiaozi* in circulation and growing concerns about their convertibility, the creation of a state monopsony on Sichuan tea caused their value to depreciate. Tea merchants had been the primary users of *jiaozi*, but this source of demand evaporated after Wang's administration created the Sichuan Tea Market Agency in 1076 and in effect nationalized the production and sale of Sichuan tea. A report of 1086 observed that whereas before 1076 *jiaozi* had circulated at a 10 percent premium, they now were being discounted 10 percent. In the first years of the twelfth century, with defense costs spiraling out of control, the state drastically raised the emission of *jiaozi* to more than 24 million *guan*, a twenty-fold increase over the original quota. The surfeit of paper money, exacerbated by a growing problem with counterfeiting, incited a steep depreciation of *jiaozi*, which by 1107 sank to less than 10 percent of their face value.

With Sichuan's *jiaozi* currency now virtually worthless, the Song government decided to replace it with a new paper money called *qianyin* ("cash draft"). The name of the new bill can be read as a contraction of *xianqian jiaoyin*, the promissory notes issued by the Monopoly Trade Bureau, and indeed there is a genealogical connection between them. A few years earlier, in 1100, government finances suffered an enormous setback when floods ruined the Xiezhou salt ponds and deprived the government of one of its major sources of revenue. With the Xiezhou salt vouchers temporarily obsolete, in the summer of 1105 the state resorted to issuing large quantities of new coin-denominated notes called *qianyin* as a substitute. The *qianyin* initially gained acceptance in the northern parts of the empire, where coin was usually in short supply, but after the salt ponds renewed production later the same year and salt vouchers once again were tendered to the public the new currency quickly lost its foothold in the marketplace. In 1106, less than a year after it was issued, the new currency was discontinued. However, a year later, when the court decided to replace Sichuan's *jiaozi* notes with a new paper currency, it borrowed the name *qianyin*.

In an effort to raise the value of paper money by reducing the quantity in circulation, the Sichuan *qianyin* introduced in 1107 were exchanged on a 1:4 basis with the old *jiaozi*. A year later, though, the Sichuan *qianyin* had fallen to a mere 10 percent of their

face value. Faced with this unanticipated depreciation, the government opted for radical surgery. The new prime minister, Zhang Shangying, a Sichuan native and staunch fiscal conservative, declared that current issues (nos. 41–43) would not be redeemed, in effect rendering them worthless. Zhang also put an end to the practice of releasing two issues simultaneously, while reestablishing the former quota of 1.25 million *guan* for the new issue (no. 44) scheduled to be released in 1111. In addition, the term of expiry of the new bills was lengthened from two to three years. Zhang's demonetization of current *jiaozi* and *qianyin* bills no doubt provoked turmoil and distress, yet the disruption was short-lived. More positively, the sharp contraction in the quantity of paper money helped to reverse the severe depreciation that had bedeviled Sichuan's economy for more than a decade.

Yet the respite was only temporary. In 1127, the armies of the Jurchen Jin kingdom, originally based in northern Manchuria, overran Song defenses and seized the capital at Kaifeng, forcing the imperial government to flee to southeastern China. The Song house reestablished itself at a temporary capital at Hangzhou, but throughout the Southern Song (1127–1276) period the northern half of the empire, the original Chinese heartland, was ruled by first the Jin conquerors and then the Mongols, who overthrew the Jin in 1234. The Song-Jin frontier extended from the Huai River valley and the sea in the east to the northern perimeter of Sichuan in the west. Sichuan, even more isolated from the new capital in the southeast than the former capital at Kaifeng, shouldered a heavy burden of maintaining the empire's defenses along its lengthy border with the Jin. Recurrent military crises of the Southern Song period forced Sichuan's fiscal intendants, who now operated with considerable independence from the central government, to resort to printing more and more *qianyin* to cope with spiraling military costs. In 1128, Sichuan halted the minting of iron coin and began to increase the issue of *qianyin* notes. By 1136 some 25 million *guan* of *qianyin* were in circulation, prompting the Hangzhou government to issue orders forbidding any further increase. The threat of renewed hostilities (and the outbreak of war in 1161) compelled Sichuan officials to print more and more money, however, and the amount of *qianyin* in circulation steadily swelled, reaching a total of 80 million *guan* by the first decade of the thirteenth century. From the 1130s to the 1190s *qianyin* circulated at roughly 30–40 percent of their face value, yet this stable ratio indicates that the bills still enjoyed some measure of public confidence. *Qianyin* became the region's monetary standard, as shown by the increasingly common practice of expressing prices and debts in *qianyin* units (*dao*). Unlike *jiaozi*, *qianyin* were not redeemable in hard currency. In any case, the quantity of iron coin in circulation in Sichuan remained low (only 1–2 percent of the total regional money supply), and iron coin was used exclusively as a petty fractional currency. Consequently, the regional government in Sichuan adopted the *qianyin* as its monetary standard for tax payments as well as expenditures. This guarantee of acceptance in state payments helped to stabilize the value of *qianyin* in private exchange.

The fall of North China to the Jin in 1127 radically reshaped the empire and its resource base, necessitating a wholesale reordering of the Song fiscal administration and its monetary policies. Shorn of its hard currency reserves (as many as 100 million strings of bronze coin may have been left behind when the court fled Kaifeng), the government used a variety of promissory notes to procure military supplies in the provinces, and especially in the new frontier zone along the southern bank of the Huai River (Huainan). Though these promissory notes nominally were redeemable in cash at the Monopoly

No actual specimens of Song or Jin paper money are known to exist. The oldest surviving examples of Chinese paper money date from the Yuan period. Thanks to the wide distribution of Yuan paper money across a swath of arid central Asia, hundreds of Yuan notes have been excavated by archaeologists in recent decades. A number of engraved brass printing plates from the Song and Jin periods allow us to remedy some of the omissions in the artifactual evidence, though the Song-era printing plates in particular have been subject to persistent doubts about their identity and authenticity. Descriptive accounts of paper money by contemporary Chinese authors also offer valuable testimony that sheds light on the manufacture and use of the earliest forms of Chinese paper money.

An encyclopedia of Northern Song political institutions dating from the first or second decade of the Southern Song period provides some information about the privately issued *jiaozi* that circulated in Sichuan in the early eleventh century. According to this account, the consortium of merchants granted the privilege of issuing *jiaozi* in 1005 used paper of uniform size and color and printed designs with illustrations of people and buildings. Merchant also affixed their own unique trademarks or seals in red and black ink on the bills in order to verify who bore responsibility for redeeming the note. These notes did not have fixed denominations; instead the issuing merchant would inscribe the value of the bill by hand at the time it was tendered. After the government took over the issue of *jiaozi* in 1024 it modified the form of the bills by including fixed denominations and terms of expiry, but we have no evidence for the design of the state-issued *jiaozi* notes. We do know that when the *jiaozi* bills were replaced by the new *qianyin* currency in the early twelfth century their format was substantially altered in order to distinguish the new currency from the old, which the government had abruptly voided. The new-style *qianyin* introduced in 1111 were printed using a set of six printing plates. Four of the plates—one including some portion of the text of the authorizing edict, two specifying the denomination and term of expiry, respectively, and a fourth plate simply identified as the reverse face—were printed in black, while the other two plates, printed in blue and red, illustrated narrative scenes. All six of the plates also included figural designs of an unspecified nature. More fulsome descriptions of the design of *qianyin* have been preserved for issue nos. 70–79, issued between 1161 and 1179 (for one example, see table). These issues appear to conform to the model established in 1111 of using six printing plates to produce three-color bills with a variety of figural and narrative designs on both sides. The figural and narrative designs changed with each issue of *qianyin*, and the reverse illustrations varied among the different denominations of each issue.

DESIGN OF SICHUAN QIANYIN ISSUE NO. 70

Design Element	*Description/Text*
Issue number	Issue no. 70
Date of issue	Thirty-first year of Shaoxing reign, *xinsi* year (1161)
Serial number and denomination (five rows, affixed to top of bill)	Inscription: "Attaining wealth also enriches the realm"
Blue-inked face figural illustration	Golden cock holding an edict
Red-inked oval figural illustration	Long-life wisteria
Term of expiry figural illustration	Dragon and tortoise bearing charts and documents
One-*guan* bill reverse face narrative illustration	Three-handled jug and dragon design
500-*wen* bill reverse face narrative illustration	"Wang Xiangxiao is moved by the leaping carp and flying sparrow"

Song China ca. 1200, with monetary regions. I: Capital and Southeast; II: Sichuan; III: Huainan; IV: Hubei.

Trade Bureau in the new capital of Hangzhou, the public had little confidence in them and prices skyrocketed. To make matters worse, the output of the state's mints plummeted to a mere one-tenth of the annual average in the Northern Song. The government was forced to debase its bronze coin, which in turn invited widespread counterfeiting. Northern Song issues of full-bodied bronze coin vanished from circulation, compounding the monetary crisis. In response to this turmoil in the money market, moneychangers in Hangzhou began to issue their own negotiable bills, known as "convenient cash bills" (*bianqian huizi*; also known as *jifu huizi* or "consignment bills").[2] Government officials evidently considered these private *huizi* bills unwelcome competition for their own promissory notes. In 1135, the state banned the circulation of private *huizi* beyond the

walls of Hangzhou, but the resulting hue and cry forced officials to rescind the ban the next day. Privately issued *huizi* also circulated in other parts of southeastern China, but the range and quantity of these notes cannot be determined.

By the late 1150s, the shortage of currency (which contemporaries referred to as "coin famines") had begun to cause acute distress. Scarcity of coin throttled trade, grain prices fell, and peasants found themselves trapped between deflation and mounting burdens of taxes and debts. In 1159, fiscal officials seized upon reports that private individuals were hoarding as much as a million strings of bronze coin to persuade the court to impose severe restrictions on savings of coin. Henceforth, private citizens were allowed to hold a maximum of 10,000 strings of coin (families of officials were allowed 20,000 strings). Any excess stocks of coin beyond these limits had to be surrendered to the government in exchange for commodity vouchers. The 1159 antihoarding law, though it probably had little effect on hoarding of coin, may have dealt a sharp blow to the private *huizi* by seriously compromising the liquidity of moneychangers who issued such notes. Six months later, in early 1160, the Hangzhou prefect Qian Duanli began to issue *huizi* bills in the name of the prefectural government as a way of augmenting its scarce cash reserves. The bills issued by the prefectural government were deemed legal tender within the capital, but private bills continued to circulate without restriction. Later in 1160 Qian was promoted to a major post in the Ministry of Revenue, where he began to campaign for a government takeover of *huizi*, emphasizing their utility as a means of financing the military. The court agreed, and assigned responsibility for printing and issuing the new notes to the Monopoly Trade Bureau. When introduced early in 1161 the state-issued *huizi* bills were warmly greeted by the public, and soon drove the private bills out of circulation.

The initial issues of *huizi* were restricted to Liangzhe Circuit, the region around Hangzhou. In the first year the Monopoly Trade Bureau issued 4 million *guan* of *huizi* in denominations of 1, 2, and 3 *guan*. (Smaller denomination of 200, 300, and 500 *wen* were issued beginning in 1164.) After six years, however, the total amount of *huizi* in circulation had grown to 28 million *guan*. Although the notes nominally were convertible with coin, the state had set aside only meager reserves to back them; moreover, many local officials refused to accept them for tax payments. In practice, then, the notes could not be redeemed for hard currency, and by 1166 their market value had seriously eroded. Emperor Xiaozong (r. 1162–1189), a man of scrupulous caution in fiscal affairs, was skeptical about the new paper currency, and when its value began to falter he resolved to withdraw the *huizi* from circulation. In 1166–1167 his government disbursed 3 million *liang* (112,500 kilograms) of silver to redeem and retire *huizi* notes. This redemption still left nearly 6 million *guan* in circulation, but the removal of excess notes from circulation caused the value of the remainder to rebound, which in turn persuaded the emperor to persevere with the new currency. In 1168, the government established a new set of procedures for managing the *huizi* notes. In imitation of the Sichuan *qianyin* paper money, *huizi* henceforth would be issued with a three-year term of expiry, with each issue limited to a total of 10 million guan. At the same time, the state formally declared that the *huizi* paper money was not convertible to hard currency. The relative success of the inconvertible Sichuan *qianyin* paper currency since its inception in 1107 had prompted an important shift in monetary thought among Song statesmen. Previously, it was an article of faith that specie convertibility was essential to maintaining popular confidence in the value of paper money. The same thinking underlay the use of commodity vouchers as financial instruments. Yet in Sichuan the *qianyin* notes, though

discounted relative to their nominal value in coin, maintained a stable value throughout the twelfth century. Consequently, Song fiscal officials began to emphasize acceptance of paper money in state payments rather than specie convertibility as the key to maintaining the value of fiat currencies. In keeping with this principle, in 1170 the government adopted a formula requiring that state expenditures and receipts be paid half in bronze coin and half in *huizi* notes.

Already in the second year of the operation of the new *huizi* system (1169) the government decided to release a second issue of *huizi* and allow two issues—a total of 20 million *guan*—to circulate simultaneously, as had already become the practice with Sichuan *qianyin*. Subsequent issues would coincide with the retirement of previous ones (i.e., issue no. 3 would be used to retire issue no. 1, issue no. 4 would retire issue no. 2, and so forth). The term of expiry was lengthened to six years or more (no. 4 circulated for ten years), but the principle of having two issues of *huizi* circulate simultaneously was maintained until the early thirteenth century. The Song also kept a tight rein on the amount of *huizi* in circulation until 1183, after which the volume of *huizi* steadily increased (see table 4.1). For the first twenty years after the monetary and fiscal reforms of 1168–1170 the *huizi* bills retained popular favor and circulated in the marketplace at close to their nominal value.

In the early 1190s, however, the surfeit of notes in circulation caused a sharp depreciation in their value. In 1206, the Song launched an ill-fated offensive against the Jin that ended two years later in humiliating defeat. At the same time the regional commandant

We lack details for the design of the Southern Song *huizi* bills, but the deposition of a forger arrested in 1182 for carving woodblocks for counterfeit *huizi* offers some important clues. The forger reported that he and his accomplice had cut six pear wood printing blocks, forged official signatures, and prepared designs with human figures and other scenes. The forger mentions an illustration of a particular narrative tale, but the caption is too vague to be positively identified. He made several hundred copies of one-*guan* notes, using red ink for the official seals, blue ink for the serial number, and black ink for the remainder of the design. Thus the design of the *huizi* bills seems to have corresponded to that of the *qianyin* used in Sichuan, most notably in the use of six separate impressions and three colors.

Although the *huizi* forger used wooden printing blocks, genuine Song bills were printed using brass plates. A printing plate now in the collection of the Museum of Chinese History in Beijing is believed to have been used in the manufacture of *huizi*. At the center of the plate is an inscription that reads "*Huizi* Treasury of the Provisional Capital" (i.e., Hangzhou). In the center of the top portion of the plate is an inscription in seven vertical columns that exactly replicates the language of an edict of 1162 stipulating the criminal penalty for counterfeiting paper money (execution by beheading) and offering monetary rewards to informers. This text is flanked by two cartouches that state the denomination (one *guan*, short-string) and serial number of the bill. At the bottom is an illustration of what appears to be a landscape scene. There is some dispute about whether this specimen was an official printing plate; its provenance is unknown, and the lack of a date of issue, term of expiry, and any official seals or signatures suggest that it is certainly incomplete. However, since a total of six printing plates were used in the manufacture of *huizi*, it is plausible that this plate represents one piece from a set.

TABLE 4.1.
VOLUME OF HUIZI IN CIRCULATION IN SOUTHERN SONG CHINA

Issue number	Term of Circulation	Quantity of Notes (millions of *guan*)	Total Volume of Notes in Circulation at Time of Issue (millions of *guan*)
1	1168–1171	10	10
2	1170–1173	10	20
3	1171–1180	10	20
4	1173–1183	10	20
5	1180–1186	10	20
6	1183–1189	18	28
7	1186–1195	23.23	[41.2]*
8	1189–1198	?	[46.5]
9	1195–1204	30	[53.2]
10	1198–1204	?	[60.0]
11	1204–1211	36.33	83.9
12	1204–1211	47.58	83.9
13	1207–1211	55.48	139.4
14	1211–1234	112.63	232.4**
15	1211–1234	119.80	232.4**
16	1231–1240	133.55	365.9
17	1234–1264	139.86	273.4
18	1240–1276	?	?

* Numbers in brackets are estimates based on the assumption that the quantities for issues nos. 8 and 10 were the same as the previous issue nos. 7 and 9, respectively.

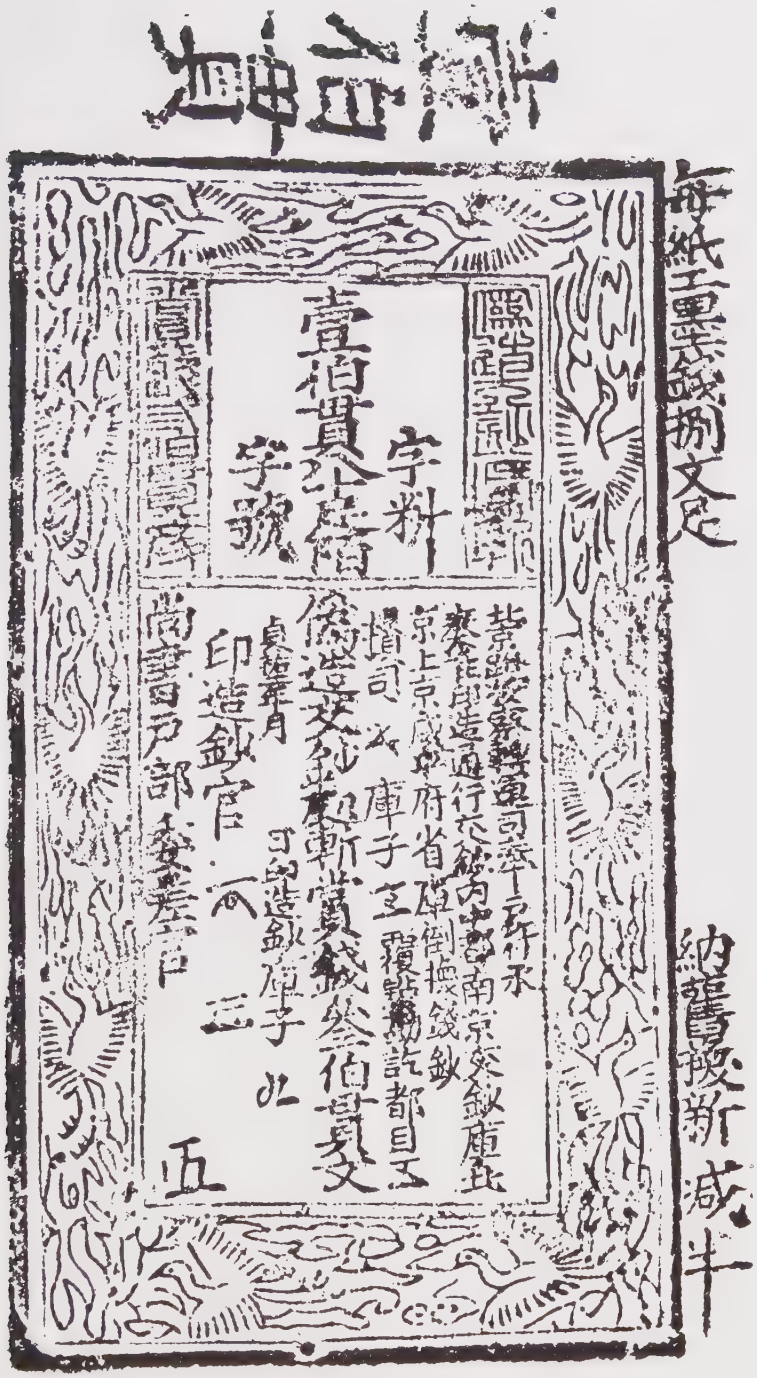
** Beginning with issue no. 14 the Song government abandoned the principle of fixed terms of expiry and instead repeatedly issued the same notes over an extended period of time. Thus the figures in this column for issue nos. 14–15 indicate the total volume of these notes issued over their lifetime (1211–1234), not when they were first issued.

in Sichuan seized the opportunity to declare independence from Song rule. Although the Song succeeded in recovering Sichuan, the costs of these civil and foreign wars overwhelmed the capacities of its fiscal system. In 1207, the government for the first time allowed three issues of *huizi*, a total of nearly 140 million *guan*, to circulate simultaneously. This resort to wanton printing of paper money led to steep discounting, and the actual market value of the notes fell to half of their face value. In 1209, with peace restored, the Song tried to revive the value of *huizi* by disbursing coin, land grants, monopoly goods, and official titles to repurchase about two-thirds of issue no. 11 bills. Two years later, in 1211, the government retired issue nos. 11–13 with the issue of nos. 14 and 15. With the intent of reducing the quantity of notes in circulation, the government stipulated that the old notes could be redeemed for new ones only at a 2:1 ratio. This official discounting of issue nos. 11–13 proved unwise, however. The market value of the discredited bills collapsed, and the creditworthiness of the new bills remained dubious. The new issues circulated at only about 60 percent of their nominal value.

The reformed *huizi* paper money system inaugurated in 1168 was confined to the southeastern circuits of the empire (and thus contemporaries frequently referred to this currency as "southeastern *huizi*"). Even during interludes of truce with the Jin, the Song government found itself caught in an endemic monetary war. The Jin had inherited an enormous windfall of bronze coin and gold and silver bullion upon capturing the Song capital of Kaifeng in 1127. Moreover, the peace treaty signed in 1141 obligated the Song to pay large annual indemnities of silver and silk to the Jin. Nonetheless the Jin suffered from endemic shortages of coin, and the purchasing power of bronze coin in the Jin territories was much higher than in the Song domain. Consequently the stock of bronze coin in the Song realm tended to drain—through clandestine trade, since export of coin was strictly forbidden—to the Jin territories (and abroad to Korea, Japan, and Southeast Asia as well). The Jin sought to ensure that the coin in its possession would not return to the Song by creating a coin-free buffer zone along its border with the Song. In 1154, the Jin issued its own paper currency, known as *jiaochao* or "exchange vouchers," to substitute for bronze coin in the frontier provinces south of the Yellow River, at the same time prohibiting the use of bronze coin in the same regions.

The Song responded by creating its own buffer zone of fiat currencies. In 1165, the Song issued a new *jiaozi* currency specifically limited to the Huainan region between the Huai and Yangzi rivers, while at the same time withdrawing bronze coin from this region. The Huainan *jiaozi* failed to win acceptance, though, and were withdrawn two years later. In 1170, the Song tried a different tactic by introducing iron coin to Huainan, which circulated uncomfortably with the bronze-coin denominated *huizi*. Subsequently the Song repeatedly tried to establish a regional paper currency in Huainan (during 1192–1202, and again after 1218), with limited success. Since these later issues of Huainan *jiaozi* were denominated in the region's iron currency, they were not readily exchangeable with *huizi*, which created a considerable obstacle to trade between Huainan and the southeast. Also in the 1160s the Song created yet another regional paper currency (known as *huhui*) for use in the Hubei region along the Jin border between Huainan and Sichuan. The limited geographic range of the Huainan and Hubei paper currencies severely circumscribed their utility in exchange, and both paper currencies were deeply discounted against even the depreciated southeastern *huizi*. Thus, for the last century of Song rule the empire in effect was divided into four distinct monetary regions (see map, p. 74): I, the capital and the southeast (*huizi* and bronze coin); II, Sichuan (*qianyin* and iron coin); III, Huainan (*jiaozi* and iron coin); and IV, Hubei (*huhui* and both bronze and Huainan iron coins). These four regions also coincided with the jurisdictions of the four General Commissariats established by the Song court to oversee fiscal administration and logistical support of the armies stationed along the Song-Jin border. This overlap attests to the primary purpose of Southern Song paper currencies as means of state payments. Yet with varying degrees of success, in each region paper currency also served as a major means of exchange in private trade, especially in the commercially more advanced regions of the southeast and Sichuan.

The *jiaochao* paper currency issued by the Jin state in 1154 was said to be modeled after Sichuan's defunct *jiaozi* currency. Like *jiaozi*, *jiaochao* had a fixed term of expiry (seven years in the case of *jiaochao*) and were convertible with bronze coin. The Jin briefly attempted to mint its own bronze coins, but with little success. In 1189, the Jin government closed its mints and adopted the *jiaochao* as its monetary standard in place of bronze coin. At the same time the seven-year term of expiry was abolished, and in practice the principle of convertibility was abrogated as well; those who turned in old or worn bills would



We are well informed about the nature of Jin paper monies even in the absence of actual specimens, in part because a greater number of printing plates survive, and in part because Jin paper money apparently was manufactured using a single plate. This *jiaochao* bill dating from 1214 is typical of Jin currency in having a decorative border with pictorial motifs of flowers or auspicious creatures (here phoenixes). Inset in the top portion of the bill is a panel stating the value of the bill (in this case, 100 *guan*) flanked by blank spaces in which the serial numbers of the bill would be written by hand. The top panel is flanked by cartouches with a legend in archaic script announcing the penalty for forging paper money (beheading) and the reward offered to informers (300 *guan*). The text in the lower panel repeats the penalty and reward in standard script and specifies the issuing agency (Beijing Fiscal Intendancy); the treasuries at which the note can be redeemed (in addition to Beijing and Kaifeng, which are mentioned on all Jin bills, this specimen also mentions two provincial treasuries in southern Manchuria); and the year of issue. The lower panel also has blank spaces for the signature seals of officials responsible for the manufacture and issue of the bill, six in all. In addition, outside the border at the top of the bill the value is written in large graphs (oriented toward the left edge), and along the right edge is a legend specifying the fees for purchasing or redeeming notes (8 and 4 cash, respectively).

receive new notes, not hard currency, in return. The suspension of convertibility clearly unsettled the marketplace. The value of *jiaochao* began to fall, forcing the government to trade salt vouchers for *jiaochao* in order to curb depreciation of the latter. The Jin also adopted the Southern Song practice of using formulas for state payments stipulating that payments be made in certain proportions of bronze coin, silver, and *jiaochao* (usually 50 percent or more of the total). These monetary reforms quickly ran aground on the shoals of new fiscal predicaments. In 1194 the Yellow River dikes burst, devastating the agricultural heartland of the Jin realm, and beginning in the following year the Jin was forced to contend with a new challenge on its northern frontier—the confederation of mounted warriors assembled by Chinggis Khan (ca. 1167–1227). Like the Song, the Jin came to depend on its paper currency to finance the provisioning of its frontier garrisons. The use of paper money for state payments quickly drove whatever little bronze coin remained in common circulation into private hoards, as an 1194 edict imposing strict limits on private holdings of coin testifies. In 1197, the Jin introduced a new system of silver coinage, but within two years this experiment was aborted because of rampant counterfeiting.

War with the Song in 1206–1208, though it resulted in victory, left the Jin government impoverished and weakened. In 1211, Chinggis Khan launched a devastating invasion that culminated in 1215 with the capture of the Jin capital (at modern Beijing) and the

The *baojuan* notes issued beginning in 1215 use a design similar to the *jiaochao* bill on p. 74, with a few changes, as can be seen in this plate for a 50-*guan* note. Immediately below the strings of coin the name of the note ("Zhenyou Reign-era Treasure Certificate") is printed in large graphs. In addition, the right border of the plate (on which the actual text is reversed) includes two partial, diagonally affixed seals of the provincial treasuries (in this case, in Shaanxi) where the bill could be redeemed. From the inscriptions on Jin printing plates it is clear that provincial agencies as well as the central government issued notes, and their primary purpose was to transmit funds between the revenue collection agencies in the capital and military garrisons in frontier areas. The large denomination of surviving notes (ranging from a minimum of 5 *guan* to as much as 100 *guan*) no doubt testifies to the steep inflation that accompanied the Jin's adoption of paper currency as its monetary standard in 1189.

whole of the Jin's Manchurian homeland. The Jin court, having fled to the former Northern Song capital of Kaifeng, quickly drafted a new set of fiscal initiatives to raise revenue for defense, including the creation of a new paper currency called "treasure certificates" (*baojuan*). The steep depreciation of the Jin paper currency is attested by the much larger denominations (10, 20, 50, 100, and 1,000 *guan*) in which the "treasure certificates" were issued. These emergency tactics only made matters worse. Profligate printing of paper money by Jin officials both in Kaifeng and in local jurisdictions quickly rendered the new currency virtually worthless. Although the Jin court managed to endure for another twenty years, its fiscal and monetary systems had utterly collapsed. At the time of the final annihilation of the Jin at the hands of the Mongols in 1234, its paper currency had become defunct and what little trade remained was conducted using uncoined silver as the means of exchange.

Though the Jin's preoccupation with the Mongol incursions provided the Song with a temporary respite, the Song monetary system suffered another series of shocks in the 1230s. The great Hangzhou fire of 1231 destroyed a large swath of the capital, including (ominously) the imperial family's ancestral temple, and the enormous costs of rebuilding prompted the government to release a new issue of *huizi* (no. 16). This flood of new paper currency caused the market value of *huizi* to sink to a new low of 220 *wen*. In 1234, the Song released a new issue of *huizi* (no. 17) and simultaneously disbursed gold, silver, and salt vouchers to retire issue nos. 14 and 15, which had been in circulation for twenty-three years. These measures reduced the quantity of paper money in circulation but did not restore popular confidence in the paper currency. The court then launched one misguided scheme after another in a fruitless quest to enhance the value of the *huizi*, such as requiring each household to purchase a certain quantity of bills and imposing a surcharge on landholdings to be paid in *huizi*. In the face of vehement opposition from all ranks of society, the government quickly withdrew these initiatives. The Mongol conquest of the Jin in 1234, replacing one enemy with a much more formidable menace, exacerbated the military burden and fiscal distress of the Song state. By the end of the 1230s wanton printing of paper money to cope with rising military costs raised the total amount of *huizi* in circulation to more than 350 million *guan*. In 1240, the government again made a serious miscalculation. A new issue, no. 18, was created to replace issue no. 16, but at the same time the government stipulated that the new issue was legally valued at five times the worth of issue no. 17, which was still in circulation. This arbitrary devaluation of issue no. 17 sent its market value skidding to a mere 50 *wen*, while the new no. 18 bills still were steeply discounted at around 250–260 *wen*. In 1247, in another feeble effort to rekindle faith in its paper money, the court declared that issue nos. 17 and 18 would circulate in perpetuity.

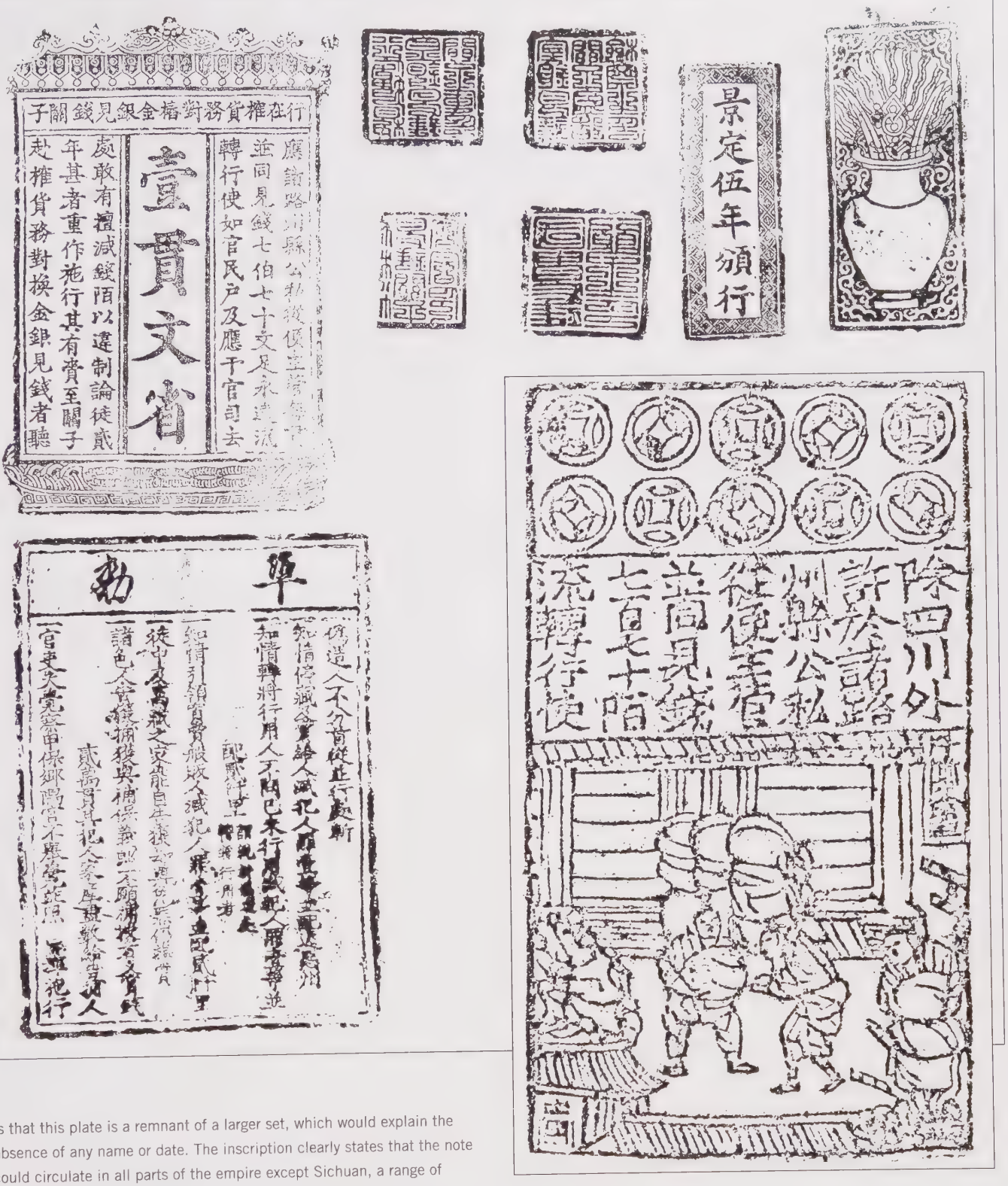
A marked deterioration in the quality of paper used in printing *huizi* also contributed to the steep depreciation of issue nos. 17 and 18. Since the inauguration of the *huizi* currency in the 1160s the bills were printed using fine papers from Chizhou and Huizhou in Anhui, areas renowned for the high-quality papers they produced for painting, calligraphy, and fine books, as well as imports from distant Sichuan. The mulberry paper from Sichuan was considered the best quality (and most difficult to imitate), but it was also the most expensive, since it had to be transported over a far greater distance to Hangzhou, where the *huizi* bills were printed. As cost-cutting gestures, issue no. 17 was printed using both Sichuan paper stock and cheap papers manufactured locally in Hangzhou, while issue no. 18 was made exclusively of local Hangzhou products. The poorer quality paper was also more easily counterfeited, further eroding the value of the last two issues of *huizi*.

* * *

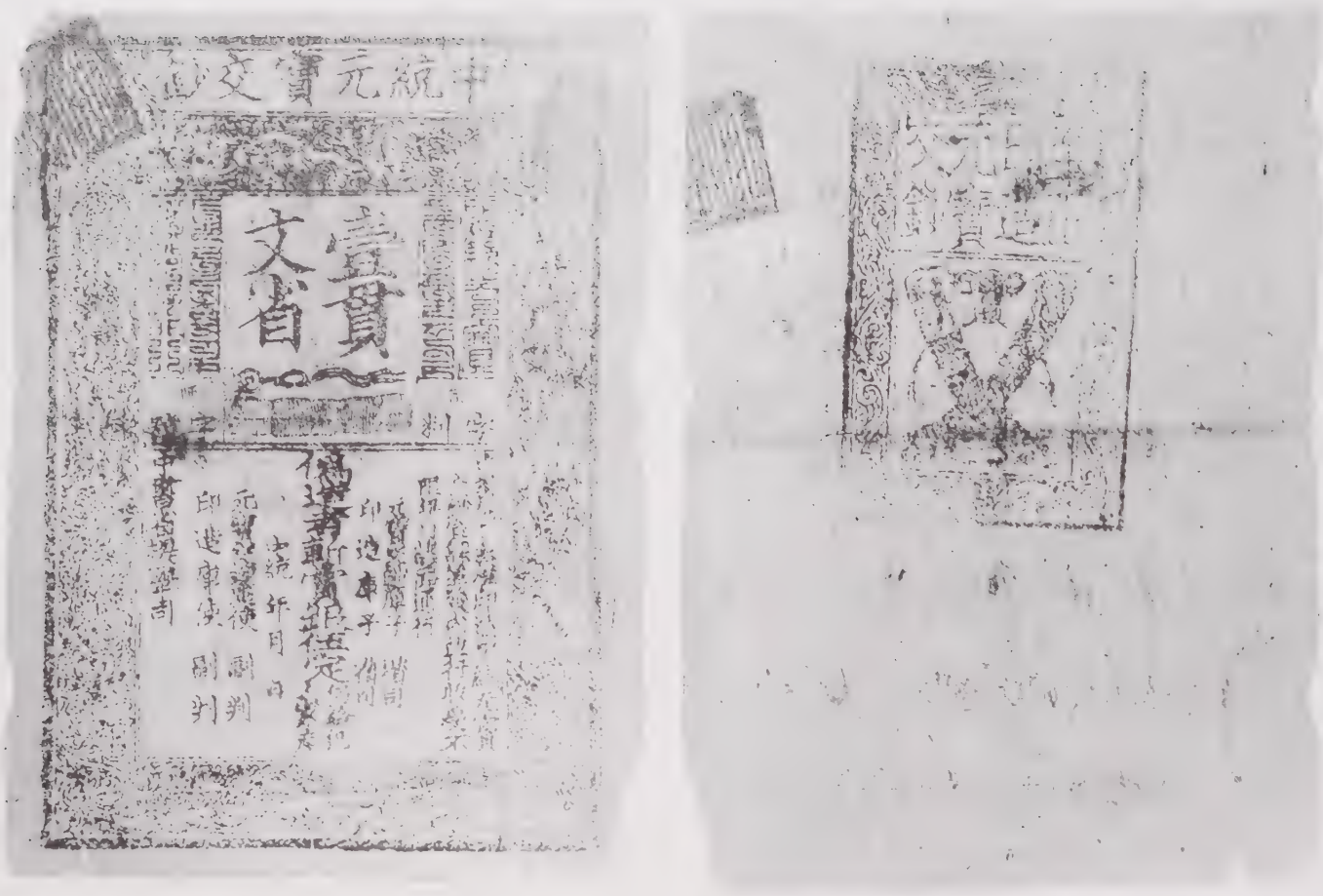
The election of Khubilai (1215–1294) as great khan of the Mongols in 1260 spelled the doom of the Song dynasty. In contrast to his predecessors, whose attention had focused on conquests in western Asia, Khubilai's ambition was to rule as emperor of China. In 1236, at the age of twenty-one, Khubilai had been granted a fiefdom in the former Jin territories in North China, and subsequently distinguished himself as both a capable administrator and military leader. After Khubilai vanquished a rival claimant to the title of great khan in 1264 he quickly turned his attention to the conquest of the Song. In the same year the long-reigning Song emperor Lizong (r. 1224–1264) died, leaving a teenage nephew to inherit the throne. Lizong's prime minister Jia Sidao (1213–1275) seized the opportunity to take firm control of the court and embark on a program of radical fiscal reform. Jia sought to raise revenue through reallocation of the tax burden, most infamously by requiring large landowners to sell most of their holdings to the state, for which the owners would be compensated in *huizi* notes. Jia also was determined to carry out a far-reaching monetary reform. In December 1264, he announced the creation of a new currency, "Gold/Silver/Ready Coin Sureties" (*jinyin xianqian guanzi*), which would replace *huizi* issue no. 18 at a rate of one *guan* of the new notes for three *guan* of the old (no. 17 was declared defunct and irredeemable). Despite its name the new currency was not convertible with bronze coin or precious metals, and the sudden abandonment of the *huizi* currency set off a panic in the marketplace. Prices once again soared, and in the next few years the government repeatedly issued edicts forbidding the discounting of the new *guanzi* currency, to little avail. The government issued annual requisitions for 20 million sheets of fine Sichuan paper to produce the new currency, but the Mongol invasions of Sichuan (which fell to the Mongols in 1271) prevented these orders from being fulfilled.

A set of eight iron plates bearing the title "Gold/Silver/Ready Coin Sureties Deposited in the Monopoly Tax Bureau of the Provisional Capital" was recently discovered in Dongzhi county, Anhui. The vertical cartouche in the center of the obverse (opposite, top left) face bears the denomination one *guan* (short-string). The accompanying text stipulates that the bill is to be accepted for both public and private payments at a rate of 770 *wen* (full-string) and specifies the penalties for discounting the bill at a lower rate. Underneath the text is an illustration of ten 100-*wen* strings of coin knotted together to constitute the full one *guan* value of the note (denoting the denomination of a particular bill with illustrations of the equivalent number of coins became a standard feature of Yuan and Ming paper currency). A second plate (bottom left) bears lengthy extracts from an edict specifying the penalties for forging or using counterfeit bills. Four of the other plates are square seals of various government agencies responsible for the manufacture and issue of paper money, written in archaic script (top center); one is an oblong seal (top, second from right) bearing the legend "Issued in 1264" (the year in which Gold/Silver/Ready Coin Surety bills were introduced) in standard script; and the final plate (top right) shows an illustration of a vase containing coins, silver ingots, and other treasures, what in popular Chinese lore is known as a "treasure-gathering bowl," a common iconographic motif for material wealth. Little documentation exists for the Gold/Silver/Ready Coin Surety notes, which appeared only in the waning days of the Song dynasty, but edicts were issued in 1268 and 1269 reiterating their official value of 770 *wen* and prohibiting discounting. This emphasis on enforcing the official exchange rate of 770 *wen* certainly is consistent with the inscriptions on the Dongzhi printing plates. This set of plates at present supplies our only complete exemplar of Song paper money. Yuan and Ming paper money specimens typically are impressed with square red-ink seals (two on each face), and no doubt the four square seals in this set were used in similar fashion.

This specimen of a Song paper currency printing plate (bottom right) has provoked controversy and debate ever since it was first published in the 1930s. The text in the central panel of the note simply reads, "Valid for public and private payments in all circuits, prefectures, and counties outside of Sichuan. Shall circulate at par with coin at the 770-*wen* rate of exchange." The upper panel depicts ten coins of the standard Chinese type (perforated with a square hole), while the bottom panel contains an illustration of three men carrying bales of goods into a storehouse. A small cartouche in the upper right corner of the illustration bears the legend "May there be a thousand such storehouses," a line taken from the *Book of Odes*, one of the Chinese classics. The absence of any identifying information regarding the type and time period of the bill has encouraged both wild speculation and deep skepticism. The most authoritative catalogue of Chinese paper money offers no identification whatsoever, while several leading Chinese scholars have hypothesized that this plate was used to manufacture the *qianyin* currency employed briefly in 1105–1106 to redeem *jiaozi* notes that were circulating outside of Sichuan. This possibility seems far-fetched. A more likely explanation



is that this plate is a remnant of a larger set, which would explain the absence of any name or date. The inscription clearly states that the note could circulate in all parts of the empire except Sichuan, a range of circulation that conforms to that of the Southern Song southeastern *huizi*, yet this bill in no way resembles the huizi bill shown on p. 76. Of course, this plate could represent the reverse side of a *huizi* bill, which would explain this discrepancy. The prominence of the stipulation that the bill should circulate at par with bronze coin at the 770-*wen* rate of exchange suggests an affinity with the late Southern Song Gold/Silver/Ready Coin Surety plates from Dongzhi (above). In fact, the language of the text in the central panel of this note is identical to the corresponding text in the central cartouche on the obverse face of the Dongzhi bill. While there is no reason to doubt that this plate is a genuine Song specimen, most likely of a late Southern Song *huizi* bill, its exact identity remains a mystery.



Nearly two hundred specimens of actual Yuan paper currency are known to exist, most of which have been recovered from tomb excavations. The Yuan *Zhongtong chao* bills largely conform to the model of the Jin *baojuan* notes, their immediate predecessors in North China. The format of the inscriptions is virtually identical to that of the *baojuan*, and the major change in decoration is that the illustration of the corresponding strings of coin is prominently displayed in the center of the bill, immediately below the denomination printed in large graphs.

Jia Sidao's reforms ended in ignominious failure, and in 1276 Khubilai's armies seized Hangzhou and deposed the last Song emperor.

After vanquishing the Jin in 1234, the Mongol rulers had divided the Jin territories into a number of largely autonomous fiefdoms awarded to various members of the Mongol nobility, including the future great khan Khubilai. These Mongol nobles followed Jin precedents in issuing paper currencies denominated in silk yarn or silver that circulated only within the region under their personal jurisdiction. For the most part, though, the Mongol overlords of the former Jin territories collected tribute in the form of silver. Chinggis's predecessors as great khan occasionally issued paper money, but only in negligible quantities. Upon his accession as great khan in 1260 Khubilai replaced the sundry independent princedoms in North China with a centralized state that in 1272 he christened, in Chinese fashion, the Yuan dynasty (1272–1368). In keeping with his goals of unification and centralization Khubilai and his Chinese advisors sought to establish a unified monetary standard that would facilitate trade between the former Jin realm and the Mongol dominions in central and western Asia. A few months after being installed as great khan Khubilai introduced a new paper currency, known officially

as *Zhongtong yuanbao jiaochao* ("'Inaugural Treasure' Exchange Vouchers of the Zhongtong Reign-period"),[3] or simply as *Zhongtong chao*, as the basis of his fledgling empire's monetary system. Although denominated in units of bronze coin, the *Zhongtong chao* could only be redeemed for silver. In order to encourage adoption of the new paper currency, Khubilai banned the use of bronze coin in exchange.

The capture of Hangzhou in 1276 and the subsequent fall of the Song dynasty presented the Mongols with formidable administrative and fiscal tasks. The Song territories encompassed a population of over sixty million, more than twice the number of inhabitants in the old Jin territories, and a far more sophisticated commercial economy. In order to meet the needs of its fiscal administration as well as private commerce, the Yuan sharply increased its output of paper currency while allowing holders of nearly worthless Song *huizi* notes to exchange them for *Zhongtong chao* at a rate of 50 *guan* of the former for 1 of the latter. The issue of new *Zhongtong chao* quickly outstripped the silver reserves of the Yuan state, leaving officials hard pressed to honor their commitment to specie convertibility. In 1282, the Yuan promulgated a new set of currency regulations that prohibited private trade in gold and silver. From this point forward the *Zhongtong chao* in effect became a nonconvertible currency. Yet the new regulations changed the unit of account of the *Zhongtong chao* from bronze coin to silver (measured in *liang* and its decimal fraction, *qian*). This shift to silver as the measure of value implied not that silver itself was recognized as the monetary standard, but rather that paper currency would substitute for silver as the means of exchange. Yet, like its predecessors, the Yuan regime still demanded that a considerable portion of state payments, particularly commodity excises, commercial taxes, and consumption taxes, be paid in silver bullion.

The retreat from specie convertibility caused a sharp depreciation in the value of *Zhongtong chao*, forcing the government to attempt a restructuring of its paper currency. In 1287, the Yuan in effect devalued the *Zhongtong chao* by 80 percent by issuing a new paper currency, the *Zhiyuan chao* (named after the Zhiyuan reign period [1264–1294]), that was officially rated as equal in value to 5 *Zhongtong chao* of the same denomination. At the same time the government specifically declared that the *Zhiyuan chao* was a pure fiat currency, inconvertible with hard currency. Initially the Yuan government displayed restraint and reduced the emission of the new *Zhiyuan chao*, but by the turn of the fourteenth century fiscal officials once again succumbed to the temptation to print excessive quantities of paper currency. Indeed, despite the official exchange rate favoring the *Zhiyuan chao*, in the marketplace the *Zhongtong chao* circulated at a value equal to or greater than the new bills. It is possible that the premium accorded to the *Zhongtong chao* was due to the fact that the latter remained in principle convertible with silver, whereas the *Zhiyuan chao* was not. In any event, in private transactions both old Song coins and uncoined silver were preferred over the increasingly suspect paper currency. Yet another attempt at monetary reform was undertaken in 1309 by issuing a new paper currency (*Zhida chao*) that, although inconvertible, was the first to be formally denominated in units of silver. This new issue was coupled with the first concerted effort by the Yuan to mint bronze coins. Yet the new coin disappeared from circulation as soon as it left the mint, and the *Zhida chao*, overrated in comparison with the existing paper currencies, failed to win acceptance. In 1311, the court halted the emission of both the *Zhida chao* notes and bronze currency. Instead, capitulating to prevailing practice in private trade, the state restored the *Zhongtong chao* as the measure of value, while also repealing the prohibition against using gold and silver as means of exchange.

Despite the acknowledged primacy of silver as a measure of value, and especially as a

The *Zhiyuan chao* bills use a format similar to that of the *Zhongtong chao* on p. 84, with one slight change: the inscription stipulating the penalty for forgery flanking the denomination was written not in archaic Chinese script but in Mongolian, using the 'Phags-pa script, as in the example above. Strikingly, the extant Yuan bills are small in denomination: many are 500 *wen* or less, the smallest a mere 10 *wen*, while the largest denominations are only 2 *guan*. The small denominations indicate that these bills were intended principally for market exchange, reinforcing the impression from anecdotal evidence—and the famous testimony of Marco Polo—that paper money had largely eclipsed bronze coin for petty transactions during the Yuan dynasty. Tacit acknowledgement of the emergence of silver as a monetary standard can be found in the rewards offered to informers for identifying counterfeiters, which on Yuan bills are always specified in silver.

store of value, silver probably was not as widely used as paper currency in actual exchange. While examples of silver used as payment for wages, loans, entertainment, and both small and large purchases abound, citations for the use of paper currency in exchange, including even the most minor transactions, are equally frequent. With bronze coin and silver both scarce, paper money provided some measure of utility if for no other reason than the lack of an alternative. After 1311 the Yuan monetary system remained stable until the late 1340s, when the mounting administrative failures of the Yuan state resulted in economic hardship, civil war, and catastrophic inflation. In the 1350s the Yuan tried a variety of desperate expedients, including new issues of bronze coin and paper money, in a fruitless effort to restore economic stability. Yuan paper currencies became utterly discredited, and by the time Mongol rule was replaced by a Chinese dynastic house in 1368 trade had regressed to the level of barter. In this economic climate precious metals were most treasured of all, and the price of silver (relative to both bronze coin and gold) reached its highest level in Chinese imperial history.

The founding of the Ming dynasty (1368–1644) raised the curtain on the final act in the history of paper money in China before modern times. The first Ming emperor, Zhu Yuanzhang (reign title Hongwu; r. 1368–98), initially planned to restore the time-honored bronze coin monetary standard, but the empire's copper mines could not produce enough metal to supply abundant and inexpensive coinage. In 1375, Zhu decided to introduce his own paper money, the *Da Ming tongxing baochao* ("Universally Valid Treasure Vouchers of the Great Ming"). The Ming *baochao* was intended to be the primary instrument of exchange and tax payments, while bronze coin would continue to be used as a subsidiary currency. Like the Yuan paper currencies, the *baochao* were issued in small denominations, ranging from 100 *wen* to 1 *guan*. In order to establish its paper currency in an economic milieu in which uncoined silver had become the de facto monetary standard, the Ming prohibited the use of precious metals as means of exchange. Despite widespread belief that the Yuan's retreat from the principle of convertibility with silver had doomed its paper currency, from the outset Ming *baochao* were inconvertible with its bronze coin or any other metallic money.

The *baochao* currency found little favor in the marketplace, in large part because Zhu Yuanzhang's grandiose imperial projects required vast expenditures far beyond his government's revenues. From the outset the *baochao* failed to maintain its nominal value, and over the next two decades the Ming court veered erratically between policies favoring either paper money or bronze coin. In 1394, after the value of the *baochao* had fallen to less than 20 percent of its face value, the Ming took the extraordinary step of banning the use of even its own coin in exchange. The ensuing turmoil only accelerated the erosion of the *baochao*'s value, prompting a flight to silver in its stead. Although the Ming had banned the use of silver in exchange as well, a prohibition frequently reiterated in the final years of Zhu Yuanzhang's reign, Ming monetary policies did little to dislodge silver from its position as the standard of value in the private economy.

The economic stewardship of the third Ming emperor, Zhu Di (reign title Yongle; r. 1402–1425), was even more reckless. The sizable deficits incurred by Yongle's costly foreign expeditions, including the famous maritime explorations of Admiral Zheng He and his fleet, and the emperor's decision to relocate the Ming capital from Nanjing to Beijing were abated, albeit only temporarily, by printing more money. Finally, in the 1430s, the Ming yielded to economic realities, abandoning its paper currency and capitulating to the dominance of silver in the private economy. The Ming state gradually converted its most

Despite the first Ming emperor's avowed intention to eradicate the taint of Mongol cultural influences, the Ming *baochao* paper currency, like many early Ming political institutions, was closely modeled on Yuan precedents. The design of Ming *baochao* essentially replicated that of the Yuan *Zhiyuan chao*. Ming notes were not inscribed with serial numbers as Jin and Yuan notes had been, and of course the Mongolian inscription was replaced with a Chinese one. All Ming paper currency bore the same nomenclature; even the first emperor's reign-title (Hongwu) was repeated on bills issued by later emperors. The text in the lower panel identifies the issuing agency (the Secretariat during 1375–1380, and subsequently the Ministry of Revenue, as in this specimen) and asserts that the bills should circulate at par with bronze coin. The remainder of the inscription specifies the penalty for forgery (beheading), and offers informers a reward of 250 *liang* of silver plus the property of the guilty party. Ming *baochao*, like Yuan bills, were issued in small denominations ranging from 100 *wen* to 1 *guan*, which again suggests that they were intended for use in private transactions—though in this case to supplement, not wholly replace, bronze coin.

important sources of revenue to payments in silver, while suspending emission of paper money and minting of bronze coin. Though still uncoined, silver prevailed as the monetary standard of the Ming and subsequent Qing dynasty (1644–1911), fueled from the sixteenth century onward by the import of vast quantities of foreign silver from Japan and the Spanish colonies in the Americas. In times of fiscal crisis, such as on the eve of the fall of the Ming dynasty in 1644 and during the worldwide depression of the 1830s to 1840s, appeals to restore paper currency were renewed, but ignored. In the nineteenth century private banks, both Chinese and foreign, began to issue negotiable bills, but the weakness of the central government after its defeat in the Opium War precluded the emergence of a unified currency. The Qing government briefly issued paper currencies in the 1850s to 1860s at the height of the crisis caused by the devastating Taiping Rebellion, but these ventures were short-lived. Not until 1935, under the Republic of China, did China once again have a unified system of paper money.

The history of paper money in China does indeed attest to the crucial importance of the state and its fiscal practices in sustaining a viable paper currency. While paper currencies, along with other paper instruments like commodity vouchers, came to play significant roles in the fiscal administration of the Song and its successors, they also served, at certain times and in certain regions, as the primary means of exchange in private trade as well. Indeed, the two major paper currencies of the Song dynasty, the *jiaozi/qianyin* and *huizi*, both originally were issued by private moneychangers. The limitations of base metal currencies as means of exchange, and especially as means of remitting funds over long distances, encouraged the use of paper tokens as substitutes. Song officials, hard pressed to generate sufficient bronze coin to meet the needs of a rapidly expanding commercial economy, also appreciated the versatility of paper money. In taking over privately issued paper currencies the Song government reasserted the time-honored prerogative of the ruler to manage the economy through control of the money supply. Of course, when faced with fiscal crisis, the Song state—and subsequently the Jin, Yuan, and Ming states as well—succumbed to the temptation to issue excessive quantities of paper currency, resulting in depreciation and soaring inflation. Ultimately, improvident fiscal policies caused the ruin of each type of paper currency, and as a result of the Ming *baochao* debacle future generations of government leaders spurned paper money altogether. Yet the final demise of these early experiments in paper money should not obscure the notable success that Chinese governments attained in creating viable fiat currencies, particularly in Sichuan, the birthplace of the first paper currency. While its reach may have exceeded its grasp, the Song state developed a complex array of fiscal and monetary institutions, including paper currencies, that enabled the government to mobilize economic resources on an unprecedented scale. The durability of Song paper money not only as a means of paying taxes to the state, but also as the common currency of private trade, was indeed a remarkable achievement.

5

Paying in Paper

A Government Voucher from the Southern Song

WILLIAM N. GOETZMANN
AND ELISABETH KÖLL

Financial instruments and markets are widely regarded today as fundamental to the operation of the global economy. Until the recent advent of electronic exchange, paper securities were the lifeblood of the market-based global capitalist system. Paper securities facilitated exchange among agents and institutions in an international economy that has grown increasingly oriented toward corporations and private, as opposed to public, enterprise. Many bearer securities either were themselves objects of value, or represented legal and liquid claims on private enterprise and its derivatives. What if such instruments of capitalism had never been invented—or at least had never grown to their current prevalence? What if private entrepreneurship, and its attendant financial architecture, had not evolved to the dominant position it has today? In this chapter, we consider this counterpositive—the development of a large-scale public economy managing widespread enterprise and governmental operations with instruments that capture some but not all of the features of the financial securities studied in this volume. Although it is not precisely correct to do so, it is tempting to interpret this alternative technology as the road not taken in world economic history. The logic of this temptation becomes clearer in the broader context of Chinese history.

利民鈔

利民軍糧經費

利州行使

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大宋建定元年　月　日

An Early Paper Security

The focus of this chapter is a rather modest printed document from the Song dynasty (960–1279). In some sense, it is the prosaic nature of the piece that makes it interesting. A woodblock print in black ink on thin, brownish paper, the instrument measures approximately twelve by six inches, and reads vertically. The text is divided into two registers: a horizontal title in the top register, and three vertical columns of text in the bottom register. In the center is an image of a flying horse, and stamped in red ink over the text in the bottom register is a seal, now faded and illegible. A simple, rectangular black border surrounds the text. The upper two corners of the border are diagonally truncated. The printing is blotchy, with smudging that suggests it was pulled unevenly from the press while wet. The unevenness is most apparent in the central figure of the winged horse—the head is only barely visible, while the flanks and long tail are relatively strong and clear. The document has a number of wormholes and damage to the upper corners and some black ink stains at the bottom. It has been mounted on a board for preservation and display.

The Text

The top register of the document reads *li min chao* which, roughly translated, means money certificate for the public benefit. The character *chao* in the title denotes a certificate of value, and is now the term commonly used in China to mean "banknote." The text of the document appears in the bottom register in three columns. The first column reads, roughly, "Lizhou General Military Authority," then at the bottom, the character for "name." The next column reads "Lizhou traveling official, 500 wen," *wen* meaning coin or "cash." The third column contains a date—the first year of the Jiading reign in the Song dynasty (1208). This is followed by a space for a date to be written in the conventional format of year, month, day. Thus, this document was likely printed in 1208 or after, in Lizhou, a prefectural capital northeast of today's capital of Sichuan province, Chengdu. The prefecture of Lizhou was one of four political subdivisions comprising the modern province of Sichuan during the Song. It was strategically significant for the imperial government as China's western border with Tibet, and from time to time it shared the northern border with the rival Jin dynasty rulers in North China.

Etymology

Perhaps the most exciting aspect of the text on the Lizhou document is the word *chao* in the top register. This appears to be the earliest extant document bearing the character in its title. Chapter 4 traces the evolution of paper money in Sichuan at the end of the tenth century. It began with the use of promissory notes which were more convenient than bulky strings of iron coins. At the beginning of the eleventh century, the government gave sixteen merchant houses the monopoly on these notes, but due to various problems the government later decided to take back that monopoly by setting up the Jiaozi Currency Bureau in 1023.[1] The first official issue of a paper note by the Chinese government can be traced to the year 1024.[2] However, these first Chinese government notes were not called *chao* but rather *jiaozi* (exchange bills).[3] Two printing plates for *jiaozi* are extant, but neither contains the term *chao*. Although the earliest use of the character in Chinese writing is not specifically known, etymological reference sources trace its use to the Song dynasty. The character may derive from a homophone character of similar appearance—with the

Opposite: *Song Dynasty government voucher. Black ink printed on paper.* Printed certificate entitled "li min chao" which translates roughly as "money certificate for the public benefit." Issued by the Lizhou General Military Authority for use by a traveling government official, who could use it to remit a payment of 500 *wen*.

hand radical in place of the silver radical—which means "to seize" or "to collect." Whether or not the root of the word lies in an active verb to seize, sources suggest that in the Song dynasty the *chao* character was used in two economic contexts involving payment or obligation. The *Hanyu dacidian*, a definitive etymological Chinese character dictionary, notes that the term *chao* designated a government voucher or receipt used in payment for purchase of goods, and was also used as the term for a voucher indicating payment owed for rent.[4] The dictionary mentions the use of the term *chao* on paper money from the Ming dynasty (1368–1644) but does not mention its use in this manner in earlier periods. On the other hand, printing plates for paper money certificates from the Jin dynasty (1115–1234) have survived in an archaeological context. The Jin dynasty of the Jurchen people seized the Chinese capital of Kaifeng in 1127 and ruled North China during most of the Southern Song dynasty. They fought a series of wars against the Song, before their power eventually fell to the Mongols. The Jin adopted the use of paper notes from the Song and issued notes termed *jiaochao*.[5] Although the notes did not use *chao* in the heading, extant examples contained the warning in the text that "counterfeiters of *jiaochao* will be beheaded." The passage suggests that in the Jin dynasty, the term had come to denote paper money *per se*.

After the fall of the Jin, the term began to be used as the definitive word for paper currency. The *chao* character finally appears in the heading of a financial certificate called *baochao*[6] during the Yuan dynasty (1272–1368). The Mongols adopted the Jin and Song practice of issuing paper money, and the earliest European account of paper money is the detailed description given by Marco Polo, who claimed to have served at the court of the Yuan dynasty rulers. Whether Marco Polo ever actually saw China, or whether his account, written around the end of the thirteenth century, is based on stories from travelers to the Far East collected over decades at his family trading post in central Asia, is open to debate; however, the general accuracy of his description of Yuan paper money is not. Clearly, judging from these travel accounts, Europeans in the thirteenth century were aware of paper money, and perhaps even knew of printed vouchers and transfer certificates in circulation by the early fourteenth century.[7] It is tempting to attribute the emergence of an active exchange and money remittance market in Europe during the fourteenth century to the adoption of Chinese models.[8] Unfortunately, there is little empirical basis at present to verify or reject this hypothesis—it can only highlight an interesting temporal conjunction between early European contact with China and the beginnings of Europe's first use of long-distance monetary remittances. One might expect that, had Italian princes of the late Middle Ages figured out how to print money, they would have done so.

The term *chao* is probably best known from the *Da Ming tongxing baochao* (Universally Valid Treasure Vouchers of the Great Ming), which are the only ancient paper money certificates that survive in modern collections in any quantity and mostly date from the turn of the fourteenth century (see p. 88). The use of paper money virtually ceased in China from the fifteenth century until the nineteenth century. Paper notes issued privately by traditional banks (so-called native banks or *qianzhuang*), pawnshops, and merchants reappeared in the bimetallic monetary system of the Qing dynasty (1644–1911) during the late eighteenth century. In the second half of the nineteenth century they were increasingly used to fund government expenditures related to suppressing the Taiping Rebellion (1850–1864) and coping with the economic and financial impact of this crisis on China's national economy.[9] In the words of economic historian Yeh-chien Wang, "not until the early twentieth century did banknotes and demand deposits constitute the largest component of the money supply" in China.[10]

Thus, the Lizhou certificate bears one of the earliest uses of the term *chao* on an issued document used for payment in lieu of coinage, and this term was progressively incorporated into the text and title of Chinese paper money over the Jin and Ming dynasties, before it eventually became a common term denoting paper money, appearing on the final great public issue of government paper money in imperial China.

A Financial or Monetary Instrument?

So is the Lizhou note the oldest known example of paper money? Almost certainly not. The note does not match the contemporary descriptions of paper money from the Song, nor is its design consistent with an instrument intended to circulate widely. The note may be a voucher used by traveling officials, and could have been used for payment at official hostels, or perhaps even more broadly for payment outside government agencies. In short, it was likely a traveler's check issued by government officials. Blank spaces for date and name (presumably of the official) suggest that the note was made to be filled out upon use. An alternative explanation for the certificate is that it was used by the military for payment of goods confiscated for use in war. It would seem plausible that the military would have the power to requisition goods in an emergency and pay for them with a paper obligation, rather than with coin—which after all is difficult to carry in large quantity. The argument against the requisition form hypothesis is the designation of its use by a traveling official, although the text is ambiguous enough to allow for alternative interpretations of the phrase. Whether traveler's check or requisition form, the Lizhou certificate was certainly some type of voucher used for remitting payment. As such it either symbolized or promised future delivery or exchange in minted coin to the holder.

The general idea of a remittance voucher in China dates to at least the Tang dynasty (618–907). During the Tang dynasty, Chinese provinces maintained chancelleries or "memorial offering bureaus" in the capital. Something like modern lobbying offices, they served the provincial government's interests. Under the Tang, these chancelleries began to function like transfer banks. Merchants sold goods in the capital and then deposited their profits with the provincial chancelleries, which wrote them a receipt called *feiqian*, or "flying cash," so called because the money could "fly" back to the province without being carried overland. The *feiqian* consisted of two parts: one half of the voucher was held by the merchant and the other half was held by the bureau. When both were returned to the province, the merchant would present his half of the receipt to the governmental office for full payment. The chancelleries liked the system because it provided them with ready cash to meet expenses in the capital, whereas the merchants liked the system because it relieved them of the risks and expenses of transporting cumbersome hard currency. As a result, this remittance system kept copper cash from gravitating to the province, it increased the money supply in the country's commercial center, and perhaps most importantly, it served as an interest-free loan to the provincial agencies. Chancelleries were able to make use of the cash until the merchant returned to the province to present his certificate. Occasionally merchants would find their provincial government reluctant to promptly redeem *feiqian*. Not surprisingly, other government agencies like the finance ministry and the army competed to offer similar services.[11]

Unfortunately, since none of the Tang *feiqian* remittance vouchers have survived, we do not know whether they were dated or issued in standard denominations, or if there are other features that could teach us more about how exactly they were used in transactions. It remains unknown, for example, whether *feiqian* were negotiable in the sense that they

could have functioned as money. Here the Lizhou document offers some interesting parallels to Tang flying cash. First, it is a remittance against a government agency—a regional military authority. Unlike paper money, but like flying cash, the bill is clearly not meant for circulation. Bills from the Jin, Yuan, and Song were mostly printed by copper plate on durable mulberry bark paper. The bills all bore some form of complex decoration that made them difficult to counterfeit. By contrast, the Lizhou bill is printed on thin paper, with little embellishment, although the red seal is consistent with an official imprimatur that was used on Chinese paper money as well as many other official documents.

The most important and well-known parallels to the certificate—both etymologically and bureaucratically—are salt monopoly government vouchers of the Song dynasty. In the Song system of border delivery (*kaizhong*), merchants transported grain to the northern border areas to supply the military garrisons who were guarding the frontier against Jurchen and Mongol attacks. In return for their services the merchants were able to buy government licenses for government salt—the salt vouchers—and then sell the salt to the population at large. From the end of the late fifteenth century onward, merchants were able to buy salt vouchers directly from the government for silver without having to engage in the border trade.[12] In the three decades following the 1040s these salt monopoly vouchers (*yanchao*) circulated as money and effectively replaced the Song cash certificates.[13] Perhaps their relative success was due to the fact that they represented a commodity-backed currency superior to paper currency backed by coin.

Although these salt vouchers were termed *yanchao*, it is not clear whether they were entitled as such—no Song dynasty salt vouchers survive to the modern era, and unlike currency that was collectible through much of Chinese history, there are no illustrations of commercial vouchers in Chinese historical texts. Nevertheless, by the time the Jin used the term *jiaochao* in their paper money approximately a century later, the term had clearly come to indicate currency as a generic term. Although the Lizhou certificate is not a state monopoly voucher, it was part of the broad, paper-based voucher and remittance system that the Chinese government used to support centuries of national defense, especially in the border areas. It is of some interest that the modern Chinese term for paper currency derives from the use of state vouchers in place of coin. Although the connotation is perhaps lost now, for a long time paper money in China definitely retained the added meaning of a document representing a privilege, or concession extended from the government, as opposed to the right of a bearer.

The Iconography

The Lizhou certificate has only two decorative elements: the truncated border and the flying horse. The border has a connection to vouchers or certificates in other periods of Chinese history. The shape itself is familiar from inscribed Chinese stone tablets; however, there are few contemporaneous textual parallels. The shape appears centuries later in two contexts: in the form of pawnshop vouchers in early seventeenth-century China and in the form of the stock certificates issued and circulated in the late nineteenth century. The association with pawnshop tickets is interesting because pawnshops were virtually the only private financial institutions that existed in China before the nineteenth century. Pawnshops would make small loans on physical collateral at what we now consider exorbitant rates—10 percent or 20 percent per month was not unusual. People depositing their goods in a pawnshop would receive a voucher in return, representing their debt. The vouchers had the same truncated shape as the Lizhou certificate. The oldest extant

printed pawnshop voucher in China dates to about 1600—older written pawnshop receipts found at Turfan date to the Tang period.[14]

The second context, stock certificates, may derive from the pawnshop ticket. The earliest Chinese industrial enterprises with at least some corporate characteristics emerged in the late nineteenth century and were actually quasipublicly owned companies called *guandu shangban* (official supervision and merchant management) enterprises. Share certificates issued by these government-sponsored businesseses such as mines and cotton mills exhibit the same truncated borders. After 1895 the establishment of private enterprises became possible, and some business like the famous Dasheng cotton mills in Nantong, eventually evolved into a private enterprise through incorporation in the early twentieth century.[15] The design of the first share certificates of the Dasheng company from 1897—shares documenting the new *guanshang heban* status (i.e., official-merchant cooperation)—clearly had the diagonally truncated corners of the earlier pawnshop tickets as well as the form of the Lizhou voucher. Thus, this modest decorative element appears to have maintained an association with paper securities and vouchers through centuries of Chinese history.

Undoubtedly, there is some common precedent, or some continuously maintained graphic tradition, that explains this long-term association. An interesting formal parallel can be found in the format of salt vouchers. Unfortunately, no Song era vouchers are extant, thus we cannot determine whether the clipped corner design was generally associated with government agency remittances at the time. The earliest extant salt monopoly tickets date to the early Hongwu period of the Ming dynasty (1368–1398). Printed a century after the Lizhou document, these had four diagonally clipped corners, a design that can be traced back to a salt ticket used in the Ming grain-salt exchange system launched in 1371. It seems plausible to assume that the four-corner format was stipulated at the same time.[16] Later on the truncated border came to be used in land deeds and contracts from the Qing and Republican period that have survived in large numbers in Chinese archives. These private, handwritten documents established property rights and contractual agreements; as late as the 1930s printed government licenses for the collection of land tax or documents for the re-registration of land used this format.[17] The truncated border even made its way into the commercial world by appearing on medicine-instruction leaflets in the late nineteenth century, probably because it was easy to recognize and its semiofficial nature might have indicated to customers that their health matters were dealt with appropriately.[18]

In terms of iconography, the only purely decorative element on the bill is the flying horse. It is tempting to interpret this symbol as a visual reference to *feiqian*; however, the flying horse is a symbol from Chinese and central Asian mythology rich with religious and mythological connotations. The symbol of the horse appears in Sassanian metalwork and textiles, Tang decoration, Central Asian folklore, ancient commentaries on the Chinese *Yijing*, and Buddhist philosophy. Of course, one of the most famous works of art in Chinese history is the "flying" horse from a Han dynasty tomb—a magnificent bronze figure of a stallion connected to the ground by only one hoof, the hoof in turn resting on a the figure of a swallow. The term "flying horse" (*feima*) appeared on an inscribed clay brick in another Han era tomb, in this context associated with military imagery.[19] It is also tempting to make a connection between the Lizhou certificate and the Chinese Tea and Horse Agency. One duty of the Lizhou Military Authority was to purchase Tibetan horses for the Chinese cavalry and transport them eastward. The image of the horse in motion—in fact in rapid motion—might signify one of the primary goals for which the

收租票

光緒廿五年拾月初八日

周宅為給與寔收執照事今收到

起尾村佃戶杜文成名下　年

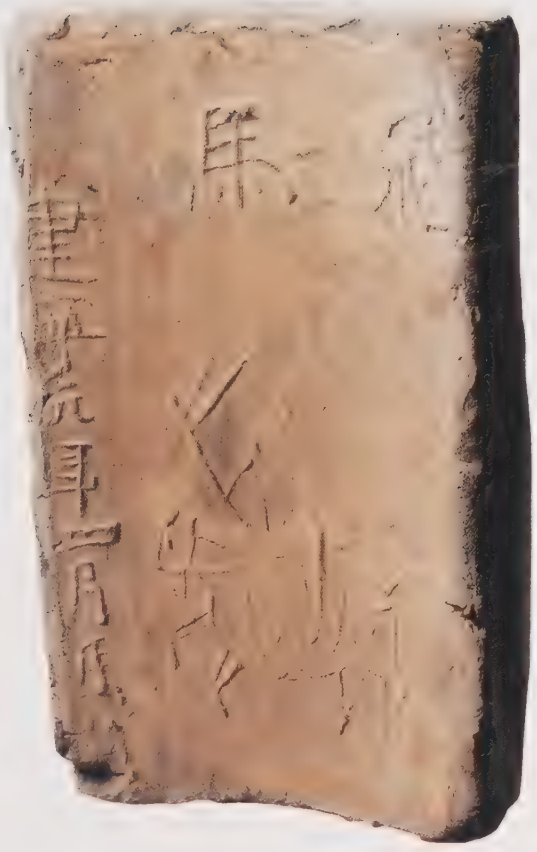
現租　足錢[illegible]十　文

嗣後該佃戶准於十月[illegible]日將租錢照

數交清不准稍有蒂欠如是日租錢不到

將地撤出另租此照

寶善堂賢字第[illegible]拾　號



Left: *Ornamental brick from a Han Dynasty tomb. Fired clay. Second century A.D.* A curved ceramic brick from an Eastern Han-dynasty tomb with the characters *fei ma* or "flying horse" associated with military imagery.

Opposite: *Qing dynasty rent collection bill. Black ink printed on paper. Additional details and signatures by hand. 1899.* A printed form, filled in by hand, indicating receipt of rent. Probably from Szechuan province. The truncated corners at the top of the document match the form of the Lizhou certificate printed eight centuries earlier.

payment was intended. Of course, the figure of the flying horse may simply have connoted speed, movement, and flight—perhaps symbolizing the weightless medium of paper money transfer itself.

Yet another possibility is that the paper document might represent "spirit money," a symbolic gift to the dead used in traditional Chinese funerals. Spirit money is a paper document symbolizing contribution of worldly wealth to the deceased for their needs in the afterlife. Although the association with the military authority would suggest a use in the here and now, the iconography has an association with the afterlife.[20]

Historical and Political Context

The broader political context of the Lizhou certificate makes it particularly interesting in the context of financial innovation in China. The Song dynasty (960–1276) is one of the most widely admired periods of Chinese history; because of its great cultural achievements it is sometimes called the Chinese Renaissance.[21] All of the high arts flourished: poetry, theater, painting, calligraphy, gardening, music, and architecture. Low arts fared as well—Song cities abounded in acrobats, circus performers, storytellers, puppeteers, dance troupes, and restaurateurs. Song science was the most advanced in the world in fields such as metallurgy, botany, astronomy, archaeology, agronomy, and chemistry. Scholars included encyclopedists, historians, poets, and philosophers, some of whom taught in academies and some of whom worked for the government. According to the traditional Confucian interpretation, government officials were expected to be highly

educated, cultured, and wise. Officials were promoted according to merit and performance based on national exams rather than upon patronage and contacts.

Commerce as well as the arts flourished in the Song. Although the traditional Confucian order did not give merchants a respected social status, they were no longer confined to market districts as they had been under the Tang, and they rose to prominence through their economic influence and activities when they were able to ply their trade widely through the city. The population of Kaifeng, the capital of the Northern Song, probably numbered half a million at its peak.

Despite being a golden age for Chinese culture, the Song was also a period during which the country fought a constant and ultimately losing battle against the steppe peoples to the West—first the Jurchen invaders who seized northern China and finally the Mongols who conquered the Jin first and then the Song. The date of the note from Lizhou places it in a fascinating time and place in world history. It was printed when Chinggis Khan (ca. 1167–1227) was near the height of his reign, just two years before he became ruler of the entire Mongol empire and seventy-one years before his grandson, Khubilai Khan, finally conquered China. Even as it flourished culturally, whole regions of the Song empire were militarized buffer zones where armies stood on alert and troops were constantly garrisoned, fed, and supported by local economies. Although the Song was militarily unified by assembling the disjointed provinces of the Tang,[22] its greatest challenge was not holding the new union together but resisting the invading forces to the north and west. The Song dynasty eventually split into two eras, the Northern and the Southern Song, because half of the country—including the beautiful capital of Kaifeng—fell to Jurchen invaders in 1127, and the imperial capital moved south to Hangzhou in 1130.

The Government and the Economy

One of the most distinctive political changes in the Song dynasty was the increasing role of the state in business and trade. Paul Smith's in-depth study of the Chinese Imperial Tea and Horse Agency, *Taxing Heaven's Storehouse*, documents the efforts by one of China's greatest ministerial "entrepreneurs," Wang Anshi (1021–1086), to appropriate the profits of private enterprise for the good of the state. Wang saw the high profits generated by merchants and profiteers who benefited from the country's perpetual state of frontier warfare, and, as Emperor Shenzong's chief advisor, promulgated a series of dramatic financial and economic reforms that effectively expropriated large portions of the Chinese economy for the state. In clear reference to the ancient minister of the Warring States period, Guanzi, Wang sought to wrest control of the price system, the "ratios of exchange" (*qingzhong*), from the private sector in order to ensure the "smooth flow of resources throughout the empire."[23] Like his ancient predecessor, Wang also saw the government control of the price system as a means to economically benefit society. The Tea and Horse Agency grew powerful under Wang's rule; it exploited the strong demand for tea to finance the constant need to purchase horses from the Tibetan frontier in order to fight the encroachment of the barbarian armies to the north. Whereas once large, powerful merchants profited from state privilege and concessions in the tea and horse trade, under Wang the state cut out the middleman, thus creating a business within the government to capture profits. Wang also set up agencies to make loans to peasants at the reasonable rate of 20 percent—a move that also put the government in direct competition with the private financial sector. The demands of the state, particularly on the front lines of battle, at

times effectively crowded out private commerce. With invaders to the north and west constantly battling the imperial troops for control over Chinese territory, soldiers had to be fed and quartered and horses and transportation had to be provided, regardless of the state's financial position.

As Smith observes, Wang Anshi invoked historical precedent to justify centralizing the nation's financial structure under a single regulator as a means to ensure economic well-being and equality:

> The Treasury Officer was the instrument by which the Former Kings controlled and regulated would-be engrossers, measured and equalized the differences between rich and poor, transformed and circulated the wealth of all under heaven, and caused all benefits to flow from a single source.[24]

Wang's crusade against private enterprise did not eliminate the quest for profit, but rather replaced portions of the private sector with the public sector—maintaining enterprise, but channeling its benefits through the central government, the "single source" mentioned in the text above. Economic rents accrued to the government as the great equalizer and steward of the flow of trade. Under Wang enterprise was allowed, as long as it was controlled and regulated and validated from above. Despite the idealism driving Wang's reforms, the new policies ended in disaster. There is a political interpretation for their failure, but from an economic perspective it is tempting to argue that price controls and constraints on private enterprise so badly distorted incentives that the system became untenable.

The Lizhou military authority was part of the legacy of Wang's governmental bureaucracy. Lizhou was a major link in a network of military depots positioned along China's northern and western frontier that facilitated the deployment of troops and materials. This authority played a particularly important role in the acquisition network for horses for the Chinese cavalry. As such, Lizhou was a vital part of the Tea and Horse Agency conceived by Wang Anshi.

In a socialist-style bureaucracy, resources are not allocated by the invisible hand of the market but rather by the enlightened oversight of government officials. The Lizhou certificate documents two levels of this allocation. The first allocation is apparent from its issue by the Lizhou general military authority. Presumably this authority received funds by general authority of the Chinese government. The second allocation is to an unnamed traveling government official who would presumably use this certificate for payment, filling in the date and perhaps the name of the person to whom the Lizhou military authority owed money. By signing and dating the certificate, it would not be an anonymous bearer security, but rather a document in a vast accounting system of governmental resource allocation—a voucher authorized by the government that, as such, allowed the central authority to control and regulate the flow of money to a particular enterprise.

Inflation and Gresham's Law

The Lizhou note thus represented an obligation of a government agency, but exactly what kind of obligation is not clear. Evidently the note was printed to be used for payment and, as such, was very much like paper money. However, there is no explicit promise to pay to bearer in coin—only the assertion that it was worth 500 *wen*. Thus, this voucher may have been fiat money—that is, paper money that derives its value from the government authority rather than its convertibility to specie.

Although denominated in coin, the value account notes of the early thirteenth century fluctuated because the government did not typically redeem them at face, particularly in times of desperate need. Peng Xinwei notes that a major Jin offensive against the Southern Song dynasty from 1205 to 1209 resulted in a huge increase in the paper money supply.[25] Paper notes in circulation increased elevenfold from 1168 to 1209—with the price of a picul of rice roughly doubling in the last decade of this period. This conflict may have been the first instance in the history of the world in which the government used the power of the printing press to finance its defense. According to Peng Xinwei's translation of a contemporary account,

> By the beginning of Jiading [1208] a string [1,000 minted coins] was worth only 400 or even less. . . . Discussion went on for several months, and the word was suddenly sent down to the prefectures to let the people turn in old vouchers to the officials, and to sell gold and silver in Lizhou. The end of the year was set as the deadline for receiving them. When the placards were posted, there was great alarm among the people. . . . The most distant of the prefectures of Sichuan were over a thousand li away. . . . The vouchers' value was only 100 cash.[26]

Thus, if the Lizhou certificate was redeemable on the same terms as the paper money in circulation at the time, the face value of 500 *wen* might have been worth only 50 *wen* in the market. On the other hand, perhaps the specification of coined money on the face of the certificate indicates that it is explicitly not redeemable in paper money. This extreme inflation was not limited to the Song but also impacted the Jin; as a result both sides in the conflict resorted to fiat money to meet their wartime costs. As a consequence of the use of fiat money and paper remittances such as the Lizhou note—as well as the active coinage, which dramatically increased the money supply during the Song and led to the world's first monetary crisis—China was the first country in the world to discover inflation.

Inflation was only part of the story, however. Song and Jin both operated in this era on a dual currency system of metal coins and paper bills. This dual system, with one currency universally acceptable and the other convertible only irregularly and not always at face value, is the classic setting of Gresham's law, that is, that bad money drives out good. In this case, imperfectly convertible paper money will tend to drive out the copper cash. Indeed, one of the Song's greatest problems was that the Jin minted very little of its own metallic currency, relying instead on Song coinage to "migrate" north—a migration helped considerably by the massive indemnity payments that the Song paid to the Jin. Perhaps for this reason, the Song restricted the use of copper coinage in frontier states in order to prevent the export of copper specie. By the same token the earliest paper money in China was restricted to use in Sichuan province—making it a kind of monetary buffer zone between the Chinese heartland and the western and northern frontier. Thus, in a real sense, the struggle between Jin and Song took place on the monetary as well as the military battlefield.

Conclusion

The Lizhou certificate of 1208 is a fascinating document. It is interesting etymologically for its early use of the name *chao* for a paper money certificate—despite the fact that the document itself is not an early form of Song paper money. It is interesting iconographically because it is the earliest known use of a certificate form that came to be associated

with tradeable securities in China from the 1600s to the 1900s, first as salt tickets and pawnshop certificates, and finally as late nineteenth-century share certificates. The continuity of the design through centuries of Chinese history parallels the continuity of the form of paper money certificates that was essentially established in the late Song and Jin, adopted by the Yuan, copied by the Ming, and then revived in the mid-nineteenth century by the Qing, with little deviation over six centuries. If nothing else, this conservatism perhaps suggests the power of graphic design and tradition to evoke public trust in the value of a piece of paper.

The document tells us little that was not already known about the fiscal and military situation of the Southern Song. The use of vouchers and certificates for remittances is well documented from the Tang period forward and is described in detail in historical accounts. In the history of financial innovation, the piece is exciting because it is the only known extant example of such a voucher, and its form helps us understand something of the details of how remittance took place within a largely government-run economy in crisis. The fact that it is certified by a military authority and allocated for specific use of a traveling official demonstrates the constraints the government placed on official funds, and the capacity the government had for accounting for its expenditures. All of this is consistent with the dramatic bureaucratic innovations introduced by the reform minister Wang Anshi in the preceding century.

The broader macroeconomic and financial context of the note it also of interest. As a paper voucher used for payment, the Lizhou note played a small role in expanding the money supply of the Song economy. Money supply expansion can be a good thing; as a stimulus for the economy, however, it has certain risks, in particular hyperinflation and loss of confidence in legal tender. In the modern world we live with hyperinflation on a regular basis. The inflation at the end of the Song dynasty was the first recorded monetary crisis attributed to the overprinting of money. Thus, the Lizhou note—printed as it was at a critical point in the Jin military offensive of the first decade of the thirteenth century, and in the year of a dramatic loss of confidence among the populace of Sichuan in the validity of paper money—is a physical document from an important moment in economic history.

6

From Tallies and Chirographs to Franklin's Printing Press at Passy

The Evolution of the Technology of Financial Claims

WILLIAM N. GOETZMANN
AND LAURA WILLIAMS

In the process of reading and interpreting financial documents, it is easy to ignore their physical, technical nature as financial instruments. True, documents like printed share certificates or handwritten bonds have considerable textual information explaining their use, but their primary feature is that they physically represent the legal claims of their owners. Consider, for example, the 500-franc 3 percent bearer bond issued in 1879 by the Compagnie Universelle du Canal Maritime de Suez. It is historically and economically important because it was used to finance the construction of the Suez Canal. The graphic design for the bond shows an aerial view of the proposed canal, Egyptian archaeological scenes, and stylized representations of the commodities the shareholders hope to ship through the new waterway: a mallet, pick, shovel, gear, and compass from Europe and America; ivory, textiles, and agricultural goods from Asia and Africa. As important as the text and the graphics, however, are the bond's technical features. The panel (or face) in the upper right of the document specifies the obligation and describes the right of the holder of the security: a semiannual payment of 7 francs 50 on the first of March and the first of September each year until 1934, and a reimbursement of the 500-franc capital by way of annual drawings over the next fifty years. The face is numbered 32,513 in a series by stamping, not printing, and is signed in ink by two individuals—neither of

1re SÉRIE
Compagnie Universelle
CANAL MARITIME DE SUEZ.
EMPRUNT DE 27 MILLIONS
Obligation de 500 francs 3% au Porteur.
N° 32513
Par Délégation :
Un Administrateur :
Le Porteur A DROIT :
1° A un intérêt semestriel de 7 fr 50 payable le 1er Mars & le 1er Septembre de chaque Année.
CANAL MARITIME DE SUEZ
1re SÉRIE
Oblig. 3 % N° 32,513
Coupon de 7 fr. 50
1er Mars 1924 88
1er Septembre 1923 87
1er Mars 1923 86
1er Septembre 1922 85
1er Mars 1922 84
1er Septembre 1921 83
1er Mars 1921 82
1er Septembre 1920 81
1er Mars 1920 80
1er Septembre 1919 79
1er Mars 1919 78
1er Septembre 1918 77
1er Mars 1918 76
1er Septembre 1934 109
1er Mars 1934 108
1er Septembre 1933 107
1er Mars 1933 106
1er Septembre 1932 105
1er Mars 1932 104
1er Septembre 1931 103
1er Mars 1931 102
1er Septembre 1930 101
1er Mars 1930 100
1er Septembre 1929 99
1er Mars 1929 98
1er Septembre 1928 97
1er Mars 1928 96
1er Septembre 1927 95
1er Mars 1927 94
1er Septembre 1926 93
1er Mars 1926 92
1er Septembre 1925 91
1er Mars 1925 90
1er Septembre 1924 89

Above: *Suez Canal bond. Multiple inks printed on paper. Hand signed. 1879 or later.* A bearer bond issued by the Compagnie Universelle du Canal Maritime de Suez. This bond entitled the bearer to a semiannual payment of 7 francs 50 payable on the first of March and the first of September, and the repayment of principal by lottery drawings beginning in 1885.

Right: *Suez Canal bond, detail.* Coupons used for claim of semiannual payment.

CANAL MARITIME DE SUEZ
1re SÉRIE
Oblig. 3 % N° 32,513
Coupon de 7 fr. 50
1er Septembre 1934 109
CANAL MARITIME DE SUEZ
1re SÉRIE
Oblig. 3 % N° 32,513
Coupon de 7 fr. 50
1er Mars 1933 106

whom appears to be Ferdinand de Lesseps—the engineer and entrepreneur who founded the company. Most of the printed area of the document is dominated by rectangular coupons (or *talons* in French) numbered to match the face. These coupons were intended to be clipped from the document and presented for the 7.50 franc payment semiannually. Apparently, several columns of coupons are missing. The earliest remaining coupon is dated March 1, 1916—presumably still unclipped because the last payments made by the company on this bond were in 1915. Interestingly, a set of coupons ending March 1, 1924, were apparently once clipped away from the bond and then glued back on.

If each coupon could be surrendered for 7.50 francs, what prevented a printer from simply counterfeiting the coupon and presenting it? Two things. First, each numbered coupon was unique, and if two coupons were presented with the same number for payment one would clearly be fraudulent. Second, the printing on the document itself is sophisticated. The bond is printed in two colors of ink: light brown and blue. The light brown was printed first, and is primarily a tiny, faint, continuous text reading "CANAL-MARITIMEDESUEZ." Before the age of photographic reproduction, this motif would have been time-consuming to fabricate and difficult to precisely duplicate. If two coupons were presented, the printing would likely reveal which was a fake. The name of the engraver (Stern) and the name and address of the printer (G. Richard) are included on the bond—presumably as certification of the quality of the work.

If the bond were retired by annual drawing, the holder would have to present the face and remaining coupons for payment. Signatures, numbers, and printing quality could all be used to verify authenticity. However, there is yet another device on the bond to guarantee its uniqueness. The left side of the instrument is randomly cut. The scoring slices through the middle of some Gothic text interwoven with floral designs. The legible part of the text reads, in part, "Canal De Suez." This part of the bond has a unique mate held by the company—the "stub" that the bond was separated from when first issued. When the bondholder (the creditor) returned the bond for a 500-franc payment, it would be matched against the company's (the debtor) matching stub, and the two halves of the scored text would be rejoined, in effect completing the obligation of the firm and retiring the debt. The random cut dividing bond from stub is the most important element in this verification technology because, while a skillful printer and forger might be able to fake the printed document, there is no way to duplicate the randomly scored line along the left edge without having the precise bond to be faked in hand. Presumably since this is a bearer security, if one had it in hand one would own it.

Interestingly, the potential for recall of the bond may explain why the pre–May 1924 coupons were carefully reglued. If the bond were not recallable, then presumably the coupons could circulate separately as financial securities. Indeed, there are many bonds of that era for which the coupons themselves had a separate market value. However, when a callable bond such as the 3 percent Suez Canal obligation was retired by the company, all coupons after the recall date were invalidated. It appears that the owner of this particular bond may have separated a set of coupons with the hope of transferring them to another party, but then thought better of the decision.

How is it that a piece of paper like the Suez Canal bond came to be universally recognized as a financial claim? How did each of the technical features—from the coupons to the randomly sliced edge—evolve? Were these important innovations, and, if so, how did they affect financial markets? In this chapter we examine the origins of several key features of the technology of financial securities—in doing so we will treat financial securities as material culture rather than documentary media.

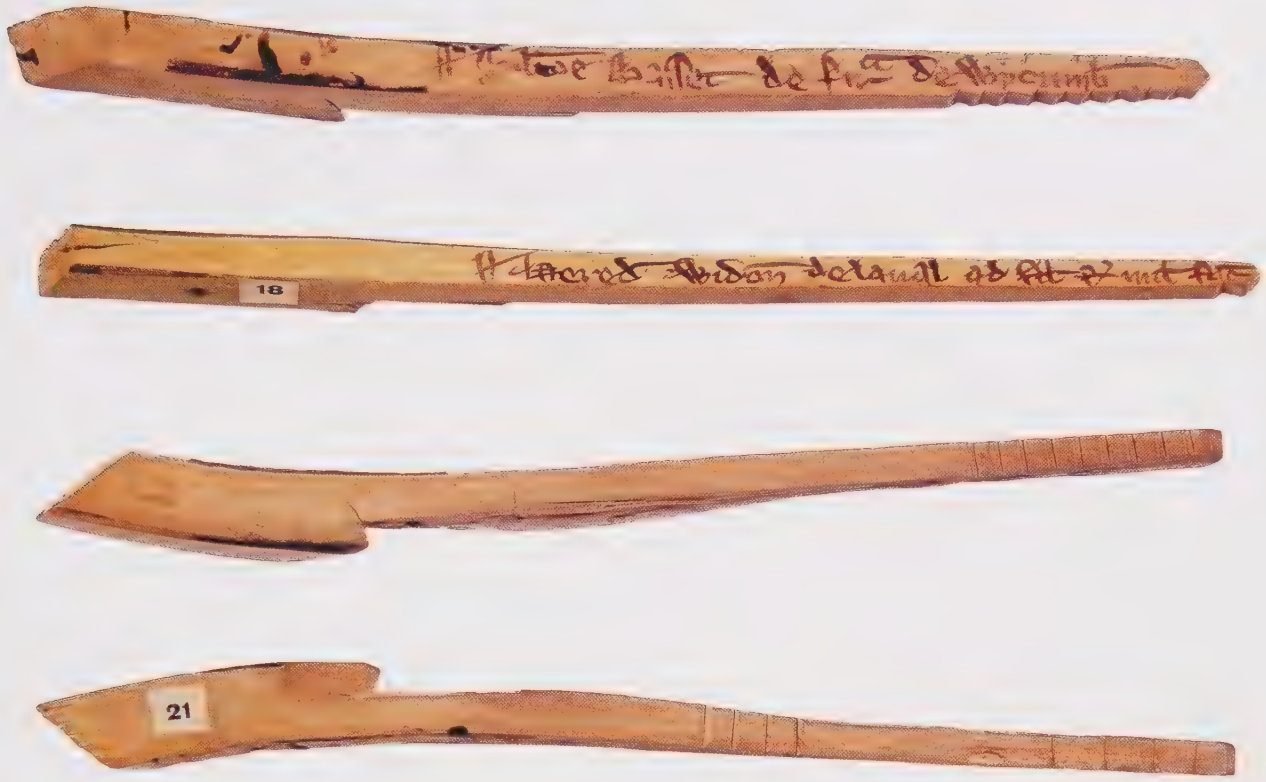
The development of the means to physically represent a financial claim engendered both great benefits and great risks. On the one hand, it allowed the proof of ownership and the legal determination of economic obligations. On the other hand, it created the potential for misrepresentation or falsification of such claims. Physical representation of claims led to the creation of liquid capital markets, but it also stimulated counterfeiting and fraud. Much of the technical development in finance over the past millennium has addressed the issue of the authentication of claims necessitated by the free flow of documents as financial instruments. The remarkable feature of the Suez Canal bond is that, as a bearer security, it could be owned and used by anybody in the world and freely transferred as the need arose. The assemblage of authenticating features of the bond made such free negotiation of the instrument possible.

Sticks and Stocks

Although the survival of financial contracts in archaeological contexts from Mesopotamia proves that contracts and financial agreements have existed for millennia, there is no evidence that the clay-based technology of cuneiform writing influenced the later development of financial instruments outside of the Middle East. In medieval Europe, one early method for the representation and authentication of financial claims was the tally stick—a technology based not on clay or paper, but on wood.

A small but extraordinary group of medieval tally sticks from thirteenth-century England has survived to the present day in a private collection. This collection comprises twenty-one sticks, each about 7 to 8 inches long with a brief text describing a transaction or obligation. The appendix contains a transcription of the texts. Each tally was made by roughly squaring off a thin branch and then notching the stick with signs indicating a quantity owed. "V" notches indicate pounds, broad grooves indicate shillings, and sharp notches indicate pence. The debtor's name and a brief descriptive note about the contract were written on the side of the stick, and then, presumably, the stick was split vertically in two with the debtor retaining one piece, the "foil," and the creditor retaining the other, called the "stock." The vertical split in the document extends typically only partially from top to bottom. The stick retained by the creditor has the entirety of the original base where it was cut from a tree or bush. These sticks all appear to be the creditor portion of a contract.

Textual evidence suggests that the tally sticks in this collection were made in the 1250s and quite likely were stocks held by the Royal Exchequer. Many reflect some fine due for an offense including contempt, trespassing, and disseisin (wrongful dispossession from the land). Some look, to the modern eye, like royal bribes. For example, number 17 records "13s 4d from William de Tullewyk for the king's good will." Tallies 1 and 18 are payments "for making the king's son a knight." The king in this case was Henry III, and his son was likely his successor, Edward I (Longshanks) who was born in 1239 and who would have been in his teens and ready for knighthood when the tallies were made. Tallies 10 and 11 refer to real estate. Number 10 reads "40 L John de Haneberwe and his fellows for the farm." Was this a mortgage document, or payment to the king for granting a property? Number 21 reads similarly "9L 4s 4d from Fulk Basset for the farm of Wycombe." Fulk Basset was the bishop of London from 1241 to 1259, and played an important political role in 1258 when the English barons negotiated a drastic reduction in the power of the monarchy, called the Provisions of Oxford. The Provisions of Oxford required half of the king's ministers to be appointed by a council of the barons. Basset's name appears as one of



Exchequer tallies. Ink on hickory wood. Ca. 1250s. Four tally sticks from a collection of twenty-one that apparently survived the 1834 fire in the houses of Parliament. The first tally, number 11 of the collection, reads "9 £ 4s 4d from Fulk Basset for the farm of Wycombe".

the barons' ministerial appointees. A natural question to ask of the Fulk Basset tally is whether it represents a royal loan to the bishop during this period of turmoil. The Provisions of Oxford also make clear the baronial displeasure with the obligations represented by arbitrary lump sum assessments called tallages imposed on the barons—tallages is essentially the same word as tallies. According to one of the provisions:

> It is to be reminded about amending the exchange of London and about the city of London and all the other cities of the King that have gone to shame and destruction through tallages and other oppressions.[1]

In fact, a number of the sticks represent obligations to the crown by prominent political figures of the day. Ralph Musard (stick 3) was sheriff and castellan of Gloucester and was famous for being among those who counseled William Marshall to accept the regency when prince Henry was a boy of nine. There is also evidence that Musard served as a judge in a ruling in 1228. John de Turbevill was a well-known "Marcher Baron" in the baronial dispute over the crown in 1265. Ralph son of Robert in tally 7 and his brother, Guy son of Robert, in tally 11 were manor lords at Shipton-on-Cherwell in Oxfordshire and were at first granted permission by Henry in the 1220s to reconstruct the castle.[2] John Lovel of tally 8 may be the same person who served as sheriff of Cambridge and Huntingdon during the 1250s. The John de Turbevill in tally 19 might be John Turbeville the elder, to whom Henry addressed a plaintiff letter about his struggle with the barons in 1264. The heirs of Guy de la Val in tally 18 are the well-to-do descendents of one of the

knights who served William the Conquerer in 1066. On the other hand, the William FitzStephen in tally 9 is probably not related to the famous biographer of Thomas Becket who bears the same name—the elder Fitzstephen was a cleric who lived and wrote in the twelfth century and presumably had no issue (but the younger could be related through a brother). The name of the abbot of Broern in tally 20 is not known; however, the fine for trespass in the forest may have been due to Henry's Charter of the Forest in 1225, which specified fines for unlicensed use of royal forest lands. To the extent that the struggle between Henry and the English barons during his reign had a financial dimension, these tallies may contribute to a richer understanding of the evolution of the power of the British monarchy during a salient historical period. As a group, they represent financial obligations by high-level political figures of the mid-thirteenth century—despite the prosaic notation regarding their fines and trespasses.

Curiously, our modern use of the term "stock" to represent a share in a corporation may derive from the stock and foil technology. Almost certainly the British term for fixed income obligations—stocks—comes directly from the use of stocks and foils up to the early nineteenth century to record loans to the Bank of England. For generations, to have "stock" in the Bank of England literally meant that one held a creditor's wooden stock, and dividends were presumably collected by presentation of the stock at the bank.

Tallies like these were an essential part of the tax collection system in medieval England. For example, they were issued by the Exchequer in its semiannual reckoning with sheriffs, who were responsible for tax and other revenue collection. On a cloth marked like a checkerboard, royal officials and each sheriff would place markers indicating the yearly total the sheriff owed and any amounts he had already paid. When both parties agreed, the amount paid or due would be cut into a tally, part of which the sheriff would retain to present at the next accounting. At that time, the sheriff would present his part and the remainder he owed.[3] As incremental payments were made in the retirement of the debt, the stock and foil would be brought together by the debtor and creditor and the ends clipped off to the notch indicating the remaining level of indebtedness. Thus, the stick technology allowed both sides of the agreement to hold a unique match representing the obligation, and the marks extended across both halves. This prevented, for example, the creditor from adding a few extra notches to the tally. The stick also allowed the incremental retirement of the debt by clipping off the obligation as it was retired. It is not hard to see the root of the idea of coupon clipping in medieval tallies and even the idea of a unique, matching document between debtor and creditor.

The tally technology became more sophisticated over the years. By about the 1320s, the English kings had turned tallies into instruments for many-sided transfers by drawing on the future, anticipating revenue, assigning debt, and operating without cash. Thus, if exchequer X ran short of funds, he would get creditor B to take not cash but a tally addressed to some tax collector A. In this way, tallies circulated like negotiable bills of exchange before reaching A. This method allowed the king to anticipate revenue and let the Exchequer shift the trouble of debt collection onto others.[4] While tallies may have been in part negotiable, in the sense that the Exchequer could pay its bills through issuance of debt, it is difficult to see how a tally could not be easily faked by a third party and sold falsely as an Exchequer obligation. How would a third-party buyer know whether the tally was a true obligation of the Exchequer, or simply a split willow twig from the branch of the Thames? If the tallies were indeed negotiable by third parties they must have engendered significant risk of counterfeiting, and there must have been some social framework for penalizing such false claims.

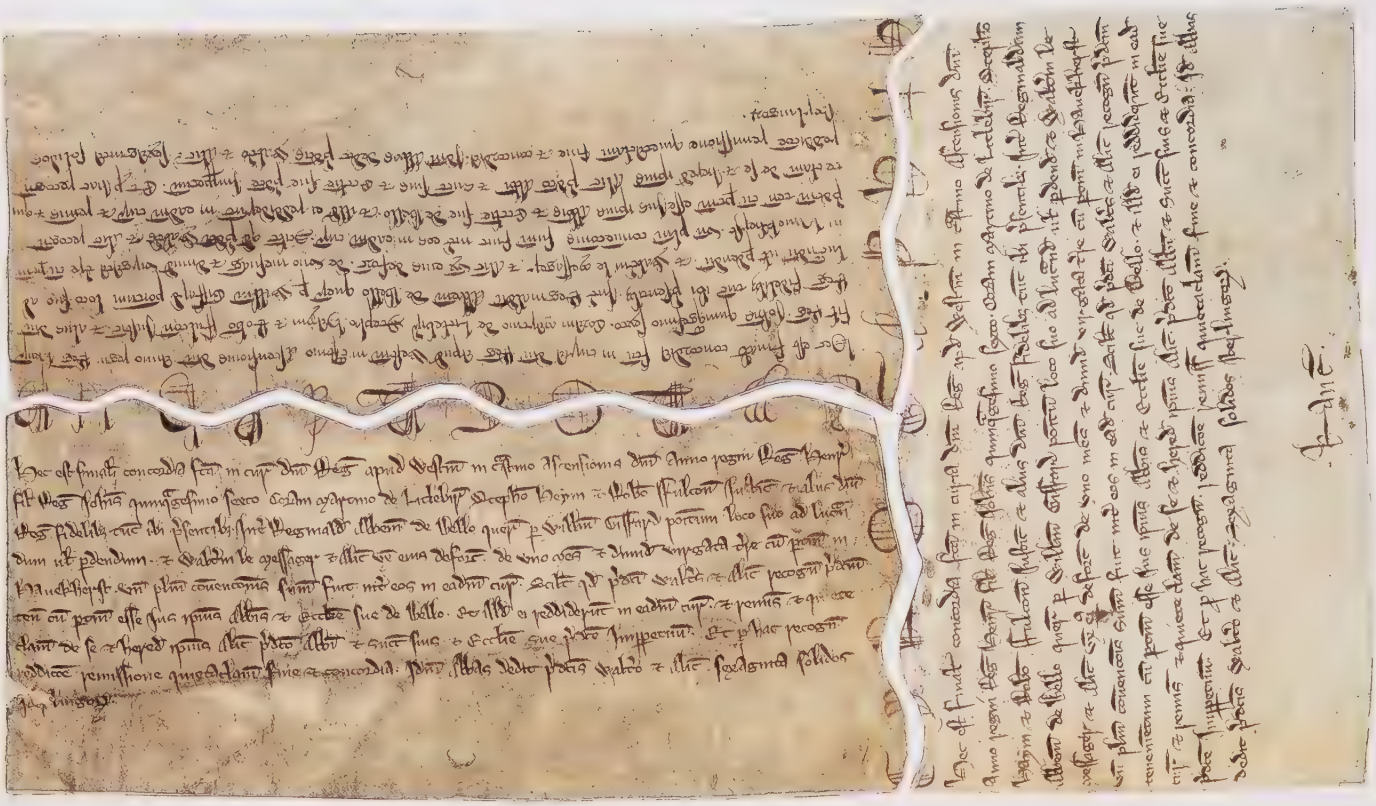
For our purposes, however, it is neither the magnitude nor the motivation behind the tallied obligations that makes them worthy of study, but rather the financing method they represent. The tallies document a means of financial contracting that survived in England for at least six centuries. The National Archives in England has specimens of tally sticks from the medieval period to the early nineteenth century. Exchequer tallies like those already discussed were usually of willow wood, perhaps six inches long, but the dimensions could be varied to suit the breadth and number of notches. Presumably the Exchequer tallies, executed approximately where the modern houses of Parliament are now located, could have been cut from the willow trees along the bank of the Thames. Willow sticks were conveniently sized and easily cut. Later inflation in England may have presented a challenge for the stock and foil technology, however. In the fourteenth century, stocks were typically about five inches long, but in the eighteenth century, when prices rose, some tallies grew up to five feet long. The Bank of England has some tallies that are eight feet long.[5] The convenient, portable, and transferable financial contract of medieval times apparently evolved by early modern times into an anachronistic burden.

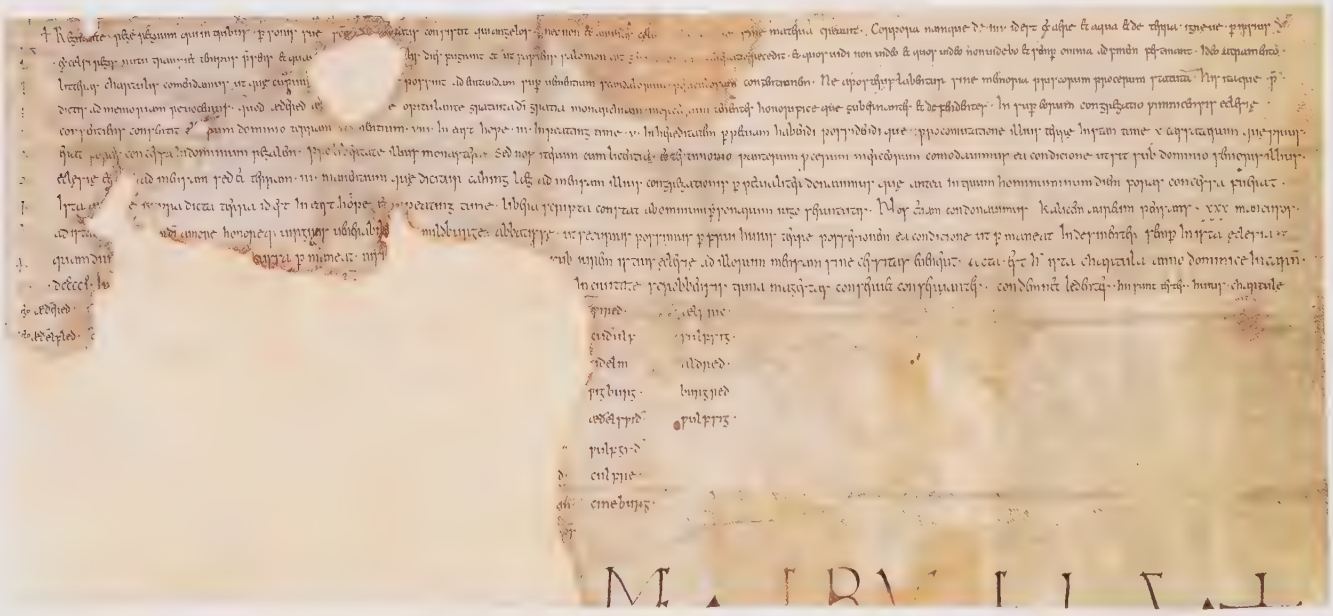
Indeed, it is difficult to understand why the English Exchequer continued to use tally sticks for so long. By the eighteenth century, the routines of the Exchequer had become a confused farce. The Exchequer could not reform itself because the tally was the only form of quittance allowed to it. An Act of 1782 abolished sinecures at the Exchequer and stipulated the replacement of paper receipts for wood ones. When the last grandfathered sinecure holder died in 1826, the act finally took effect. In the next decade, the sheriffs' and the Exchequer's obsolete accounting routines were abolished.

The tally sticks of the English Exchequer had a glorious end. The Exchequer had a great store of tallies which it periodically used as firewood. In the 1820s and 1830s, twice the usual number of tallies had accumulated in the storeroom. In 1834 the lords of the Treasury passed the statute abolishing the Receipt of the Exchequer and ordered the tallies burned. The new iron stoves under the House of Lords got out of control and the fire accidentally spread to the houses of Parliament. The great irony in this end to tally sticks is that, at this very time, the Record Commissioners were publishing the earliest medieval records in parchment, such as King John's Chancery rolls from the early thirteenth century. While the commissioners would not have dreamed of burning Chancery rolls, these records of the Exchequer were deliberately destroyed because scholars could not appreciate their value, obscured by the unfamiliar medium of wood.[6] The private collection described in this chapter undoubtedly was rescued from the famous conflagration.

Chirographs

Tally sticks were one important precedent to modern financial instruments, but they were not the only form of contract in the Middle Ages—nor indeed were they necessarily prevalent except in the particular case of the English Exchequer. There were important alternative techniques for verifying documents and transactions even when the parties to the transactions were illiterate. For example, the chirograph was used for written documents and allowed both parties to retain an exact copy of the terms of the agreement. To create a chirograph, a scribe would write two (or sometimes three) complete copies of the deed or note on the face of one sheet of parchment, leaving a space between the copies. In this space the scribe would write a word, often "Chirograph," or "Christus," or perhaps a brief alphabet. The use of Christ's name shows the gravity that a written document possessed and served as a spiritual check on any dishonest intentions a scribe





Above: *Tripartite chirograph. Ink on vellum. 1272.* Three matching parts of a chirograph. Three identical versions of the contract text were divided by wavy cuts through the words "CYROGRAPHUM."

Below: *Cotton Charter VIII.27. Ink on vellum. 901.* The upper portion of a document recording a gift of property to a monastery. A portion of the words "ME CRUCIS" are visible along the cut lines at the bottom of the document. It is the earliest surviving chirograph in Britain.

might entertain. The two halves of the parchment would then be cut apart through the word, often with a wavy or dentellated stroke. A quick visual inspection would show if the two halves matched when they were later brought together for verification. This, incidentally, explains the origin of the word "indenture." Thus, like the tally sticks, the chirograph worked on the same basic principle of verification of authenticity by the two parties retaining a unique matching document; however, the medium for the agreement was in most cases parchment, rather than a stock and foil.

Chirographs were especially popular in England and were in use there from the early tenth century through the fifteenth.[7] Chirographs were produced in both Latin and Anglo-Saxon.[8] They were used by kings, ecclesiastical lords, and other powerful people to record transactions between foundations or between an institution and an individual. But even peasants could use chirographs, as shown by a charter from about 1230 between Gloucester Abbey and the widow Emma in which she promises to provide various servile duties and rent in cash.[9] Chirographs were used for many kinds of transactions: donations to religious foundations, legal decisions, royal decrees, and military treaties.[10] Decisions from ecclesiastical courts could also be recorded in tripartite chirographs, with one copy for the archive and one for each party to the case.[11]

Rarely do both halves of an early chirograph survive. The half retained by a royal court or ecclesiastical foundation usually survives, rather than the copy retained by an individual. In the late twelfth century, the English Chancery began making tripartite chirographs, with one copy to be deposited in the Treasury.[12] After this date, survivals of two or even all three parts of a document become more numerous. All three counterparts of a 1272 tripartite chirograph recording a fine survive in the National Archives in England.[13]

The earliest extant English chirograph dates from the year 901. This Latin document records a gift of lands and buildings made by Æthered, aldorman of Mercia, and his wife, Æthelflæd, to a monastery. The upper copy of the chirograph is the extant portion. Although a large chunk of the parchment has been torn away, the upper parts of the cut words ME CRUCIS[14] are still legible at the lower edge. It is clear that there were at least thirteen witnesses. They did not sign their own names, however; the scribe has written the names of all the witnesses. This was common practice when witnesses were illiterate. Since the witnesses would not always be available to verify the contents, the value of the charter clearly lay in the fact of its being a written record, legal and verifiable, without regard to the literacy of any of the principals.[15]

The earliest Continental example of a chirograph is from France in 944, drawn up by abbot Odbert of Saint-Bertin to confirm a gift of land from his predecessors to Lotmar, son and heir of the original recipient.[16] This Latin charter is especially interesting because Odbert's predecessors had died before this document was drawn up; their signatures were apparently written by the scribe of the document. The reason for the confirmation is unknown, but this 944 document would not have been considered a forgery in the modern sense. It would have been seen as making a charter that reflected the current conditions, or as making a copy to replace a lost document.

In addition to the documents that survive as chirographs in physical form, some charters contain language indicating that multiple copies of the document are to be made and distributed to the parties to the contract. Multiple copies, of course, would allow participants to compare copies if their veracity were in question. There are several examples of this kind of document recording transactions of the ninth century but which survive only in copies made later. The relevant language is usually something like this: "We [the donor or author] order two copies of this settlement to be made. One will go to the archbishop,

the other will go to ourselves as heirs."[17] Although we cannot say with certainty that these charters were actually produced as chirographs that do not survive, there would be little sense in simply making two copies without a way to verify that they were the same.

Other techniques of verifying and authenticating charters were used in England. The author of a transaction could sign his own name, if he could write, or could make the sign of a cross if he were illiterate. In Anglo-Saxon charters, additional corroboration of the document can be provided by the author touching the document, or by language stating that the author wrote the cross with his or her own hand to confirm and validate the legal act. While it is extremely difficult to ascertain whether an author, indeed, wrote the cross attributed to his hand, if the color of the ink differs from that of the document, or if the cross is very clumsily made, there is a good chance that an unpracticed person made the sign.[18] And, of course, falsely making the sign of the cross might have serious eternal consequences.

The chirograph and the signature technologies are self-evidently important to the later development of financial securities. When financiers began to issue bearer securities in the eighteenth and nineteenth centuries, with chirographs along the edge and signatures on the document, they were utilizing a tradition of authentification that had existed in Europe for at least a thousand years. The Gothic script of the chirograph on the Suez Canal bond consciously hearkens back to the medieval technology. In this way, nineteenth century security issuers intentionally embedded a new financial structure within a much older and widely recognized tradition of claims validation.

Deeper Roots?

A thousand-year-old tradition of contract verification might seem sufficiently archaic to convince us that the roots of financial technology extend nearly into European prehistory. However it is worth asking when, where, and in what legal and economic context the idea of tallies, chirographs, and signatures first appeared. Tallies are ubiquitous in prehistoric sites, and the antiquity of notational marks on bone tallies from the Paleolithic era has been an issue of widespread academic discussion and dispute.[19] Despite considerable evidence that marks on sticks have been used by people to record quantities for tens of thousands of years, there is no known example of a prehistoric tally split to divide the tally marks in the fashion of the medieval Exchequer tallies.

The earliest extant signatures in the world (not counting the famous hand silhouettes in the upper Paleolithic cave paintings like Lascaux) are cylinder seal impressions used in ancient Mesopotamia to "sign" cuneiform documents. There are no exact Mesopotamian analogues to the chirograph and tally stick, however. For early examples of these we must turn to China.

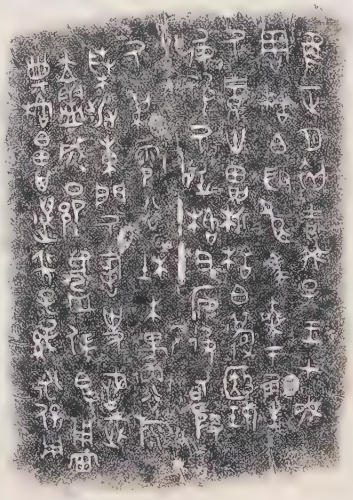
A few Chinese ceremonial bronze vessels from the Western Zhou dynasty (1046–770 B.C.) have descriptions of land deed transfers detailing the creation of a document, and then the division of the two halves between the contracting parties.[20] One striking example is a large round container from the Western Zhou called a *gui*. An eighty-two-character inscription inside the vessel explains how its owner—a man named Gebo—purchased thirty plots of land from a man named Pengsheng in exchange for four horses. The inscription indicates that two men had the land surveyed and drew up a written agreement which was then divided between them. Presumably the final stage in the transaction was the celebration of the event with the casting of a magnificent bronze vessel.[21]

The first historically recorded use of split tally sticks to represent a debt is also in

the Zhou dynasty. (See the story of the moneylender Mengchang of Qi from the Warring States period of the Zhou [770–221 B.C.], in the Introduction, p. 10). By roughly 500 B.C. in China, loans apparently were recorded on bamboo tallies and then the two halves were divided between debtor and creditor. None of these bamboo tallies has survived to the modern era, although there are some bronze tallies related to royal permissions and commands that may show what these early loans looked like. A particularly striking example is a gold-inlaid bronze tally found in Anhei Province in 1957. Shaped like a piece of bamboo with writing on the smooth exterior, the tally grants royal permission to a man named Ejun Qi—perhaps a merchant—to transport goods and pay tariffs within the province. Presumably the tax collector held one half and the traveler the other. The bamboo shape of the bronze strongly suggests that it is based upon perishable natural analogues.[22]

Did the use of split tallies develop in China and spread to the West-perhaps along the Silk Road? Or did the bi-partite contractual structure for loans, either as split tallies with notation or as written documents divided between parties, develop independently at both ends of the continent in response to similar problems of authentication and measurement? This question is difficult to answer because of the perishable nature of loan contracts: once a loan was discharged there was little reason to retain the contract.

A loan document from third-century Egypt raises the possibility that variations of the chirograph technology

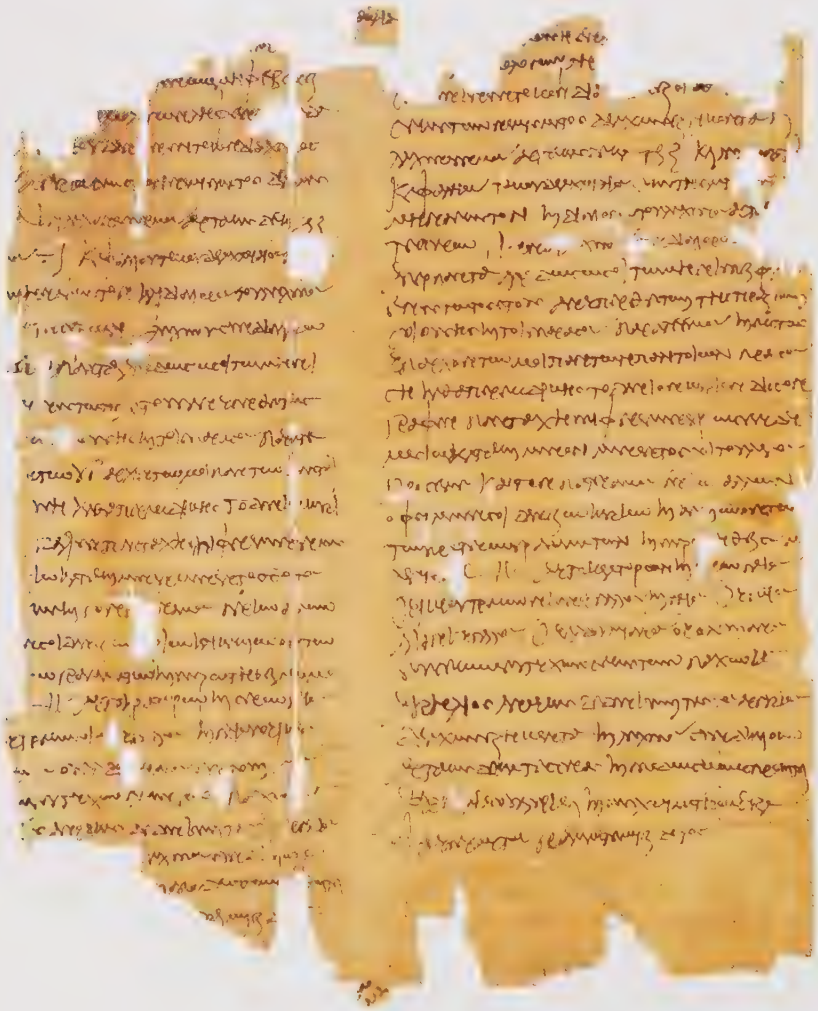


Right: Ceremonial vessel. Cast bronze. Western Zhou Period, 1046–770 B.C. This ceremonial bronze vessel (top), called a *gui*, contains an extended inscription (bottom) describing the surveying and sale of land which was then certified by a written agreement divided by the two parties.

Left: *Bronze tally sticks. Gold inlay on bronze. Western Zhou period, 1046–770 B.C.* These matching bronze tallies are shaped like pieces of bamboo. They were used as a passport for free passage and transport of goods by a traveling merchant. Although no natural bamboo tallies from this period survive, these bronze examples might indicate how they looked and how they might have been used.

were used long before the Middle Ages. This document is written on papyrus, a writing surface made from the reeds that grow along the Nile. Papyrus was used as a writing material from the late fourth century B.C. to the late seventh century A.D., roughly the periods of Greek and Roman rule of Egypt. Of the estimated 400,000 papyri that survive, the majority are in fragmentary form. This is partly because papyrus is inherently fragile and also because it disintegrates in climates with higher humidity than Egypt's. When papyrus was used for a literary text, the sheet of papyrus would have been rolled up to make storage easier. (One scholar estimates that the *Iliad* would have occupied nearly three hundred feet of papyrus.) Single sheets of papyrus were used for documentary purposes. Surviving examples include official and administrative documents such as imperial edicts, tax receipts, and census returns, but also private documents such as records of sales, leases, and letters. In addition, a number of magical texts, horoscopes, and amulets demonstrate the importance of papyrus in every aspect of life.[23]

For historians, the two-thousand-year-old business-related papyri are a window into the ancient economy—particularly insofar as they indicate how contracts relied upon the use of physical documents for verification. The loan resembling a chirograph was drawn up in a town called Phebichis in 252 A.D. in Roman Egypt. In it, a man named Aurelius Anoubas lends a woman (whose name is lost) a quantity of silver and grain. The fact that



Loan contract. Ink on papyrus. Phebichis, Egypt. 252 A.D. Bi-partite agreement, written in Greek, between Aurelius Anoubas, the lender, and an unknown female borrower, for a loan in grain, vegetables, and silver.

it is a loan is not remarkable—many of the extant papyri from this era are loans or contracts for future transactions. The document is striking because the text is bi-partite. The wording of the loan is identical in two parallel registers, presumably so that the document could be split down the middle and one side could be held by the borrower and one side by the lender. There is no way to know how prevalent this document structure might have been in Egypt since most surviving loan documents would likely be only one half of an executed agreement. This piece is unusual in that it had not yet been divided at the time it was stored or discarded. While its form is similar to that of the European chirographs from centuries later, and perhaps may have been a precursor to the chirographic form, the Phebichis document lacks the distinctive feature of a written symbol or a device separating the two parts of the text which could be matched up by the two parties. Like the wood of tally sticks and the parchment of medieval chirographs, papyrus could be cut in a way to ensure authenticity. This loan document appears to represent an intermediate form in time, space, and technology between the ancient Asian tradition of bi-partite financial contracts and the later development of chirographs in Europe.

Franklin as Financial Innovator

Less than a decade after the financial and monetary crisis of John Law's Mississippi bubble engendered widespread suspicion regarding the perils of paper money, the young Benjamin Franklin boldly circulated a proposal to increase the stock of paper money in Pennsylvania as a means of stimulating trade and commerce. His pamphlet "A Modest Inquiry into the Nature and Necessity of Paper Currency," published in 1729, convinced the members of the legislature—over the objections of the wealthy classes—to pass a bill authorizing the additional printing and circulation of banknotes. Not surprisingly, Franklin obtained the contract for printing money, and from that point on he remained deeply involved in the technology, as well as the economic implications, of paper securities. In 1739, for example, Franklin designed paper notes with the word Pennsylvania deliberately misspelled—the logic being that a counterfeiter would incorrectly fix the mistake. Another innovation Franklin introduced was a novel, leaf-shaped decorative motif whose fineness exceeded that of any other printing in the colonies at the time. Franklin achieved this effect by directly casting actual leaves in lead for the plate. The insight he had was that natural forms would be more difficult to counterfeit. In 1775, he designed the first bills issued by the Continental Congress. Perhaps ironically, given his early advocacy of paper money, these "continentals" became synonymous in the early nation for worthlessly inflated currency.

From 1776 to 1785 Benjamin Franklin lived in France as the U.S. ambassador, and perhaps his most important accomplishment at the time was to secure financial support for the fledgling democracy from France and Holland in the form of loans. In 1780 and the years following, Franklin designed and printed these loans to the United States in his personal press at his home in Passy, a suburb of Paris. The bonds reflect Franklin's lifelong interest in the innovative design of financial instruments. There were not many of these documents produced; there are twenty-one known loan documents and a few proofs, all printed between 1780 and 1781, although interestingly some of them were back-dated.

One such document, now in the collection of the American Philosophical Society, is dated September 6, 1779, and represents a loan from France. The terms of the loan were printed on two halves of a large sheet of paper and then scored down the middle with a random cut. Perhaps the most striking thing about the loan is the paper itself. A rich,

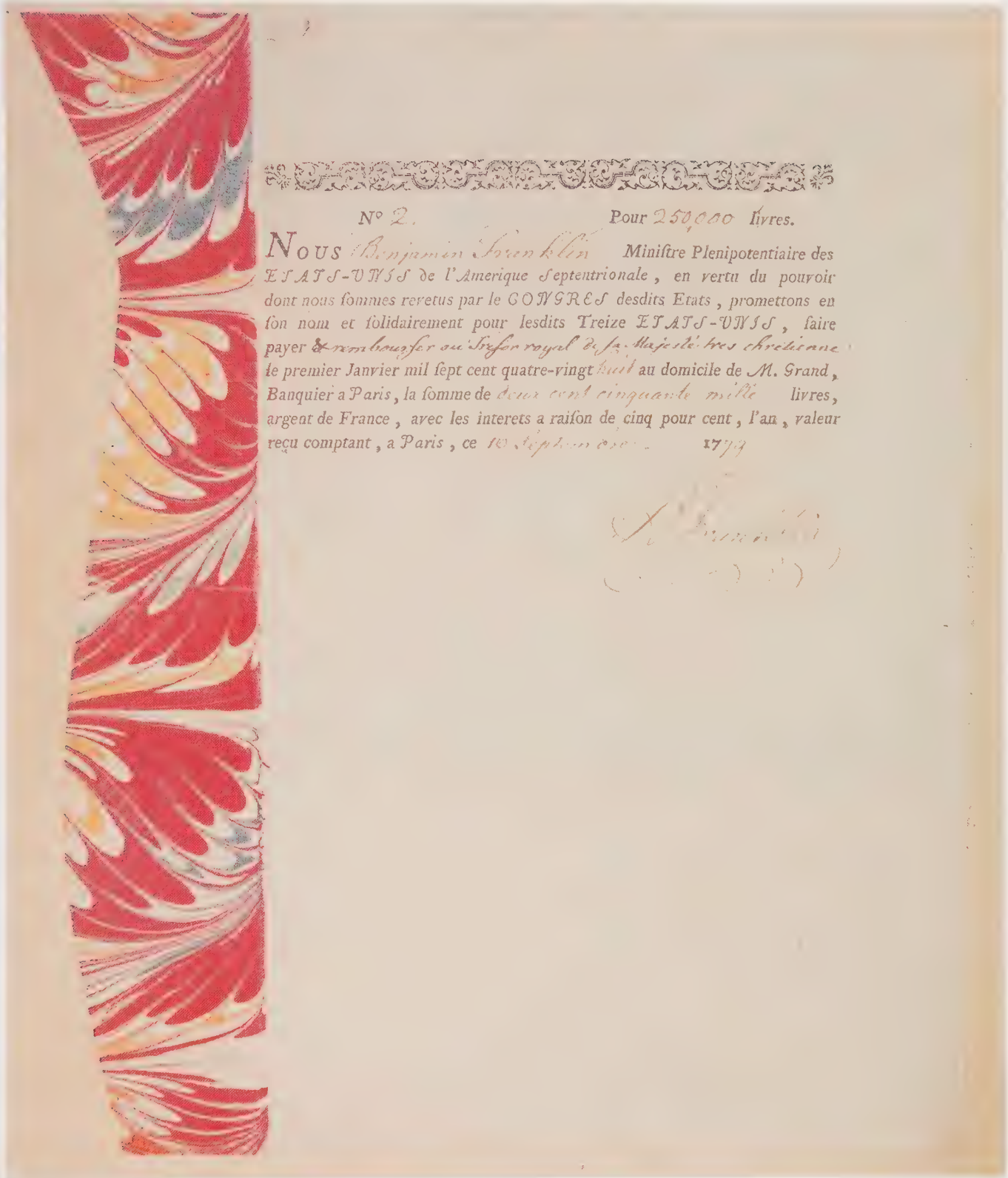
The United Colonies
TWO DOLLARS.
TWO DOLLARS. No.
THIS Bill entitles the Bearer to receive TWO SPANISH MILLED DOLLARS, or the Value thereof in GOLD or SILVER, according to a Refolution of CONGRESS, paſſed at Philadelphia, Nov. 2, 1776.
TRIBULATIO·DITAT
TWO DOLLARS.
No.
ONE THIRD OF A DOLLAR,
According to a RESOLUTION OF CONGRESS, paſſed at Philadelphia February 17, 1776.
MIND YOUR BUSINESS
ONE THIRD.
TWO DOLLARS.
Printed by HALL and SELLERS. 1776.
One Third of a DOLLAR.
Printed by Hall & Sellers, in Philadelphia. 1776.

Above, left: *Colonial note with leaf impressions. Two dollars. 1776.* Benjamin Franklin's innovation in currency design was to directly incorporate organic forms into the format of the note. Since no two leaves were exactly alike, this made the money difficult to counterfeit.

Above, right: *Continental Congress bill authorized in 1776, designed by Franklin. One-third dollar. February 17, 1776.*

marbled panel extends down the middle of each sheet where the division line would cut. Franklin's design reflects his early insight that random, natural patterns are impossible to copy. No artist would be skillful enough to create a match to a marbled half. The one challenge for Franklin was actually obtaining the paper. England was the only place in the world where such high-quality, wove marbled paper could be made—thus he had to order it surreptitiously from the London stationer James Woodmason and have it smuggled to France.[24] The irony, then, of the Passy bonds is that the documents that financed the American Revolution are printed on English paper. One other feature of the bonds fascinates historians of printing: the typeface itself was unique. Apparently Franklin designed it and had it fabricated to his specifications. The combination of a unique typeface and the marbled register for the division of the document ensured that the loans could never be faked.

Did Franklin have to go to all that trouble to prevent the United States from being cheated by her allies? Almost certainly not—his motivation for the Passy loans must simply have been his inventiveness and a lifelong interest in financial instruments. Although



N° 2. Pour 250,000 livres.

NOUS Benjamin Franklin Miniſtre Plenipotentiaire des ETATS-UNIS de l'Amerique Septentrionale, en vertu du pouvoir dont nous ſommes revetus par le CONGRES desdits Etats, promettons en ſon nom et ſolidairement pour lesdits Treize ETATS-UNIS, faire payer & rembourſer au Tréſor royal de ſa Majeſté très chrétienne le premier Janvier mil ſept cent quatre-vingt huit au domicile de M. Grand, Banquier a Paris, la ſomme de deux cent cinquante mille livres, argent de France, avec les interets a raiſon de cinq pour cent, l'an, valeur reçu comptant, a Paris, ce 16 Septembre 1779

Loan used to finance the American Revolution, printed by Benjamin Franklin. Dated 16 September 1779. Designed and printed by Franklin in Passy, France, this document records a loan from the French government to the new Government of the United States of America. It was originally printed as two registers of text on a single sheet of paper with a strip of marbling down the center. Franklin cut the bond instrument in two down the center strip. The French government retained one half and the U.S. government retained the other. The division line can be seen along the left edge of this document.

ACCION BENEFICIARIA
ACCION BENEFICIARIA
Nº 22752
BANCO TERRITORIAL DE CUBA
Nº 22752
DOMICILIO: HABANA, CUBA
CRÉDIT FONCIER CUBAIN
SOCIEDAD ANÓNIMA
CAPITAL PAGADO: $5.000.000. ORO DE LOS ESTADOS UNIDOS DE AMÉRICA.
CREADO POR LAS LEYES DE LA REPÚBLICA DE CUBA DE 20 DE JULIO DE 1910 Y 21 DE FEBRERO DE 1911.
ACCIÓN BENEFICIARIA AL PORTADOR.
CAPITAL ENTIÈREMENT VERSÉ: $ 5.000.000 PIASTRES OR DES ÉTATS-UNIS D'AMÉRIQUE.
CRÉÉ PAR LES LOIS DE LA RÉPUBLIQUE DE CUBA, DU 20 JUILLET 1910 ET DU 21 FÉVRIER 1911.
ACTION BÉNÉFICIAIRE AU PORTEUR.
CAPITAL STOCK FULLY PAID UP: $5,000,000. UNITED STATES CURRENCY.
INCORPORATED UNDER THE LAWS OF JULY 20TH 1910, AND FEBRUARY 21ST 1911, OF THE REPUBLIC OF CUBA.
DIVIDEND SHARE OF STOCK ISSUED TO BEARER.
EINGEZAHLTES STAMMKAPITAL: $ 5,000,000 IN DER GOLDWÄHRUNG DER VEREINIGTEN STAATEN VON AMERIKA.
GEGRÜNDET IN GEMÄSSHEIT DER GESETZE DER REPUBLIK CUBA, VERKÜNDET AM 20 STEN JULI 1910 UND AM 21 STEN FEBRUAR 1911.
INHABER-DIVIDENDENAKTIE.
Habana, 1º de Marzo de 1911.
Francisco B. Reyes
COUPON TRANSLATION
DIVIDEND SHARE OF STOCK NO.
COUPON FOR DIVIDEND NUMBER
PAYABLE IN PARIS, HAMBURG, LONDON AMSTERDAM, NEW YORK MADRID, BRUSSELS, BY THE BANKERS DESIGNATED BY THE BANCO TERRITORIAL DE CUBA, AND AT ITS MAIN OFFICE IN HAVANA, CUBA.
COUPON UBERSETZUNG
DIVIDENDENAKTIE NO.

Opposite: *Banco Territorial de Cuba share certificate, and detail. 1911.* The American Banknote Company designed and printed many of the world's financial securities around the turn of the last century. This share of the Banco Territorial de Cuba is a magnificant example of their work. Many of the artistic designs—from filigreed edges to detailed vignettes and near-microscopic printing—were designed to prevent the document from being counterfeited.

clever, the marbling and unique typefaces of the bonds were not practical solutions to the large-scale printing of financial securities. Franklin's lasting contribution to the technology of securities printing was the insight that natural, random forms are most difficult for the human hand to duplicate. Looking at the elaborate foliage and decorative scrollwork on paper money and stock certificates printed in the centuries after Franklin's Pennsylvania currency and his bonds at Passy, one can attribute at least some of it to Franklin's creative spirit.

Although Benjamin Franklin's firm had a near monopoly on the printing of paper money in the mid-Atlantic states in the eighteenth century, by the mid-nineteenth century, a New York firm, the American Bank Note Company (ABNC), rose to prominence as one of the major printers of currency stock and bond certificates in the world. The ABNC was founded in 1858 and for the next century produced some of the most beautiful and successful financial instruments in the world. ABNC's aesthetic innovation was to introduce classical figures into the design of shares, bonds, and currencies, so that many of its certificates have a neoclassical visual theme. Perhaps more important, the ABNC was

the leading innovator in anticounterfeiting designs—pioneering new methods of intaglio printing, undertinting, prismatic color effects, unique inks, and the development of durable "melamine" paper that made currency long-lasting as well as difficult to copy.[25] A characteristic example of the ABNC's finest engraving work is the 1911 Banco Territorial de Cuba share certificate printed in Spanish, French, English, and German—presumably for issue in each of these countries. The vignettes in the top panel are detailed engravings of Cuban scenes, and the geometric filigree around the edge of the bond is reminiscent of the decorative borders on American paper currency of the era. The key motif that displays the remarkable technological skills of the company is a rosette at the bottom of the certificate face—prominently featured above the name of the American Bank Note Company. The site of the embossed watermark of the company, the rosette contains remarkably minute lines that spiral down to its center. Along with this new authentication technology, however, the ubiquitous chirograph, with its millennium-long historical association with legal documents, appears along the certificate's left border.

The Electronic Horizon?

The future of share certificates in the twenty-first century is a much-debated topic. Some U.S. corporations have already begun to phase them out in favor of a purely electronic alternative. The primary motivation for elimination of physical certificates is that they delay transactions settlement. The three-day lag currently required to complete a share transfer allows time for the transportation of the share certificates. Advocates of completely electronic shares argue that the physical shares are an anachronism that prevents the markets from moving to "next-day" settlement. Some firms are convinced. ATT, for example, when it spun off NCR in 1996, did not issue paper certificates to shareholders except upon demand, and currently ATT is seeking to move to a completely paperless ownership structure. One obvious motivation for this is to save on printing and share reissue and replacement costs—ATT is one of the most widely held stocks in the United States, with more than a million small shareholders.

As we consider finally eliminating the financial tools of authentication, ownership, and obligation that evolved over the past three thousand years, it is perhaps worth pausing to consider what will replace them. Can electronic ownership protect an investor equally well against corporate or broker fraud? While the answer may well be yes, one hopes that someone as wise as Benjamin Franklin is involved in the design of new financial securities systems.

Appendix

Text of the tallies in the private collection

1. #6.13.4d. from the abbot of Abingdon for making the king's son a knight.
2. #3.6s.8d. from Nicholas de Hanred because he made an exchange.
3. #10 from Ralph Musard for crossing the sea.
4. #10.3s.4d. from Henry Wale because he made an exchange.
5. 6s.8d. from John la Venure because he did not prosecute.
6. #13.6s.8d. from Fulk son of Warin for a fine.
7. 6s.8d. from Ralph son of Robert for having an assise.
8. 16s. from John Lovel for rent for an assart for several years.
9. 6s.8d. from William FitzStephen for disseisin.
10. #40 John de Haneberwe and his fellows for their farm.
11. #5 from Guy son of Robert being the profits of the counties.
12. 13s.4d. from Hugh the reeve of Aston for disseisin.
13. 10s. from Robert del North for disseisin.
14. #3.6s.8d. from the abbot of Abingdon for having a record.
15. #2 from Roger de Hide for two debts.
16. 13s.4d. from Peter de Staines for having an assise.
17. 13s.4d. from William de Tullewyk for the king's good will.
18. #1 from the heirs of Guy de la Val for making the king's son a knight.
19. #3.6s.8d. from John de Turbevill for contempt.
20. #13.6s.8d. from the abbot of Broern for trespass in the forest.
21. #9.4s.4d. from Fulk Basset for the farm of Wycombe.

7

Fibonacci and the Financial Revolution

WILLIAM N. GOETZMANN

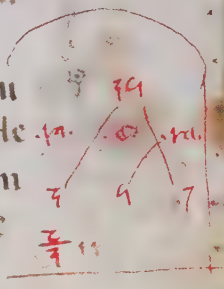
Present value analysis is a method for comparing the relative economic value of differing payment streams, taking into account the time-value of money. Mathematically reducing all cash flow streams to a single point in time allows the investor to decide which is unambiguously the best. According to a recent survey of corporate financial officers, the present value criterion is now used by virtually all large companies in the capital budgeting decision.[1] The modern present value formula was developed by economist Irving Fisher in 1930; however, it originates deeper in the tradition of Western thought.[2] Geoffrey Poitras's excellent survey of the early history of financial economics traces related interest-rate problems back to fifteenth-century Europe.[3] The roots of the present value criterion may lie deeper still. In this chapter, I argue that an important early formulation of the present value criterion appeared in the work of one of the most famous mathematicians of the Middle Ages, Leonardo of Pisa (1170–1240), commonly called Fibonacci.

Leonardo was arguably the first scholar in world history to develop a detailed and flexible mathematical approach to financial calculation. He was not only a brilliant analyst of the business problems of his day but also an early financial engineer whose work played a major role in the development of Europe's capital market in the late Middle Ages and the Renaissance. Fibonacci

Quisto ene lo liuero de labbecho secondo la oppenione de maiestro leonardo de la chasa degli figliuoli de bonaçie da pisa. Lo primo chapitolo ene de le regle de le tre chose.

Se te fosse dicta alchuna Ragione ella a le se proponesse tre chose si deuemo mlicare quilla chosa che noie uolemo sape con qlla che none de quilla medessima apatire nella ltra.

Vo glouo dare la senpio ala dicta regla e uoglo dire chusi 3 rauignane ua glono 9 cortone se que uaronno gle 7 rauignane de le fare chusi mlichare 7 fiade 9 che fonno 39 e patire p tço che ne uiene denare 11 $\frac{2}{3}$ e chusi fale semeglante Ragione.



Se te fosse dicta alchuna ragione nella quale se ppones se tre chose e daluno de le coie pate denançe auesse roc to si deuemo sape en que numero se tiuoua quisto roc to saputo en que numero se tiuoua quisto rocto si deuemo mlicare a me doro e pate denanze p tale numero en que se tiuoua qi lo rocto.

Vo glouo dare lo sempio ala dicta regla e uoglo dire chu si bracia 4 $\frac{1}{3}$ de panno ua glono 17 d que ne uaronno gle 9 bracia de le fare chusi rechare a sano p quisto rocto che terço e si di 2 fiade 4 $\frac{1}{3}$ che fanno 13 bracia or de uemo dire 3 fiade 17 denare che fanno 91 denaio o deuemo dire 13 bracia de panno ua glono 91 dena io que ne uaronno gle 9 bracia si deuemo mlicare 9 fi ade 91 denaio che fonno 299 denare a patire p 13 che ne uiene denare 19 $\frac{8}{13}$ de denaio or auemo che se bracia 4 $\frac{1}{3}$ de panno ua glono 17 d che uengono gle 9 bracia denare 19 $\frac{8}{13}$ de denaio e chusi fa le semeglante ragione et cetera.

R. BIBLIOTECA RICCARDIANA FIRENZE

wrote his book *Liber Abaci* in the year 1202 in the city of Pisa. It is best known for the Fibonacci series, a sequence of numbers describing geometric population growth. What is less well known is that the famous series is only a single example in a book devoted almost entirely to the mathematics of trade, valuation, and commercial arbitrage. *Liber Abaci* develops practical mathematical tools for calculating present value, compounding interest, evaluating geometric series, dividing profits from business ventures, and pricing goods and monies involving a complex variety of weights, measures, and currencies. The table of contents gives a sense of the structure and topics covered in the book.[4]

Contents for *Liber Abaci*

1. Here Begins the First Chapter
2. On the Multiplication of Whole Numbers
3. On the Addition of Whole Numbers
4. On the Subtraction of Lesser Numbers from Greater Numbers
5. On the Division of Integral Numbers
6. On the Multiplication of Integral Numbers with Fractions
7. On the Addition and Subtraction and Division of Numbers with Fractions and the Reduction of Several Parts to a Single Part
8. On Finding the Value of Merchandise by the Principal Method
9. On the Bartering of Merchandise and Similar Things
10. On Companies and Their Members
11. On the Alloying of Monies
12. Here Begins Chapter 12
13. On the Method Elchataym and How With It Nearly All Problems in Mathematics are Solved
14. On the Finding of Square and Cubic Roots and on the Multiplication, Division, and Subtraction of Them and On the Treatment of Binomials and Apotomes and Their Roots
15. On Pertinent Geometric Rules and On Problems of Algebra and Amuchabala

Liber Abaci begins with an exposition of the fundamentals of arithmetic, followed by chapters on valuation, relative value, companies, and metallurgy. Chapter 12 contains a wide variety of problems, including interest rate and present value examples. Chapter 13 presents a method of solution through linear interpolation, and Chapters 14 and 15 present more abstract mathematical results. Proceeding as it does from the simple to the complex, the book is organized as a manual for instruction, and it is likely that Leonardo used it himself for teaching commercial arithmetic.

It is not only the content and use of the book that makes it important, but the historical and economic context. *Liber Abaci* was written at a time of nearly unprecedented commercial interaction between East and West. Italian merchants traded actively with the Arab world, bringing exotic goods to an increasingly prosperous Europe. This period of economic vitality stimulated the development of practical mathematics—in effect, creating a market for mathematical knowledge. This knowledge, in turn became a major factor in the economic trajectory of Europe over the next several centuries. The five-hundred-year period following Leonardo saw the development in Europe of virtually all the tools of financial capitalism that we know today: share ownership of limited-liability corporations, long-term government and corporate loans, liquid and active international financial markets, life insurance, life annuities, mutual funds, derivative securities, and deposit

Opposite: Liber Abaci, *by Leonardo of Pisa. Incomplete copy, multiple inks on vellum. Ca. 1290s.* The oldest surviving copy of *Liber Abaci* is a translation of a part of the original Latin text into Italian. Although not dated, linguistic and stylistic evidence place the production of this copy to the 1290s.

banking. Many of these developments have their roots in the contracts first mathematically analyzed by Fibonacci. What began with his application of mathematics to contemporary commercial problems may have led later to important economic innovations and the development of Western capitalism as we know it today.

Fibonacci and the Commercial World of the Thirteenth Century

Interest in the medieval origins of the European commercial revolution has stimulated some remarkable scholarship, from the extensive archival explorations into the roots of capitalism by the late Robert Lopez and his students to the geography-based quantitative traditions of the late Ferdinand Braudel and his followers. The contributions of both narrative and quantitative history have created a detailed picture of the sudden emergence of trade and business in medieval Europe after the year 1000. Most scholars characterize it—for better or worse—as a commercial revolution and an economic awakening from the Dark Ages.[5] To better understand the dramatic change during this period, economists have recently begun to analyze the institutional structures that supported the emergence of long-distance trade. Italian cities had to develop new ways of dealing with foreign merchants, such as creating internally and externally recognized coalitions and business associations.[6] In the world of the merchant in thirteenth century medieval Europe, the factors that impeded European trade—from bad roads and a multiplicity of currencies to varying legal standards and lack of credit markets—also created opportunities for entrepreneurs who could surmount them.[7] Wealthy urban centers throughout the continent demanded exotic goods and an enterprising merchant and banking sector emerged to meet this demand, extending mercantile ties outside of Europe to the southern and eastern Mediterranean and beyond, importing goods from the Middle East and occasionally even further afield. Marco Polo and his brothers, for example, manned a Venetian trading station in the Black Sea region from which he launched his long journey to China or perhaps simply collected travelers' accounts of distant Cathay.

Fibonacci and his family were also an integral part of this commercial revolution.[8] According to Leonardo's brief autobiography in *Liber Abaci*, his father was an administrative official in the Pisan colony of Bugia in North Africa. Leonardo was summoned as a youth to the colony and trained there according to his father's request in Arabic mathematical methods. As a result of Fibonacci's bicultural education, he enthusiastically embraced "the Indian Method" of calculation, that is, the use of Arabic numerals. In fact, while the use of Arabic numerals had appeared sporadically in western Europe before Fibonacci's time, *Liber Abaci* was one of the first works to methodically describe the new number system to Europeans and to demonstrate its practical, commercial use with detailed and copious examples.

The Pisan colony of Bugia was an important source for two trade items: a fine grade of beeswax and high-quality leather. Originally a minor Roman colony, the city was revived in the eleventh century by the Berbers. The Pisans took the Algerian colony from their Genoese rivals in the mid-twelfth century and established a trading port that not only exported North African goods but also served as a conduit of Eastern luxury items of all kinds into Europe.

Leonardo's father served as a customs official and perhaps local representative of the merchants in the Pisan colony in the late-1100s and thus may have recorded the inflow and outflow of goods through the port.[9] At least two problems in *Liber Abaci* concern the calculation and payment of customs duties. Indeed, as an official representative of the

Italian merchants in Bugia, Leonardo's father would presumably have understood the nature and value of the merchandise they traded and perhaps even the system of record and notation, the accounts, and the language used by Arab traders.[10] Thus, Leonardo not only had an education in Eastern mathematic but also family roots in Mediterranean trade.

In his own account of his life, Leonardo explains that he traveled extensively throughout the Mediterranean as a young man—presumably as a merchant himself. He notes that he pursued mathematical knowledge from "whoever was learned in it, from nearby Egypt, Syria, Greece, Sicily and Provence . . . to which locations of business I traveled afterwards for much study."[11] Leonardo returned from his travels around 1200, at about age thirty, and published *Liber Abaci* in 1202. He apparently revised it in 1228.

The oldest extant version of the book is a handwritten manuscript from the 1290s, now preserved in the Biblioteca Riccardiana in Florence.The vellum manuscript is not entitled *Liber Abaci* but describes itself as "a book by the master Leonardo" and is listed in a later overleaf, bound with the book, as "*Arithmetia e Geometria di Leonardo d'alla Casa d'a Pisa.*" It is not in the language of the original; rather it is a translation from Latin into medieval Italian, executed in at least two professional scribal hands. This earliest surviving version is decorated in Gothic style, and, like many early abacus books, is incomplete. Much of the preliminary material explaining the use of Arabic numerals and mathematical operations, for example, is missing. The first page proceeds directly to an explanation of a method of solution by cross-multiplication—an algorithm taken up much later in the full version of the book. This omission of explanations of the number system and basic operations may reflect a familiarity with the basics of calculation.

At the time it was presumably created, schools for teaching business mathematics existed in a number of northern Italian cities. Records of these earliest business schools exist in Verona in 1284, Florence in 1304, and Milan in 1316.[12] It is interesting that the existence of a vernacular translation of the original Latin text coincides with the earliest records for business schools. An Italian text would have been particularly useful as a teaching manual in a school that focused on mathematics as opposed to other academic arts. Presumably a Latin prerequisite would have been a nuisance, given that students in these early schools began their education as early as age eleven or twelve.[13]

Certain features of this early manuscript suggest that the copyists, or perhaps a later annotator, made marginal notes in an attempt to follow along with some of the algorithms. A few notes bear what appear to represent factorization cancellations, as if they resulted from working through the problems in the text. This is consistent with the notion that the book was an early educational tool. This version also contains minor mathematical errors—some noted by the later copyist—suggesting a slow accretion of mistakes through repeated handcopying over the decades from 1228 to 1291 and implying a sustained interest in the book after its original appearance.[14]

Most later copies of *Liber Abaci* are written in the original Latin and contain not only a more complete text of the missing original but also many more detailed diagrams of mathematical operations. Biblioteca Riccadiana manuscript number 783, entitled *Liber Abacci*, is among the best. Copied sometime in the fifteenth century, it provides a date for the original work of 1202 and a date for the revised version of 1228. The text is mostly in black ink on paper, and the diagrams and fractions are typically in contrasting red ink. The use of red and black inks in both the early and later copies suggests that the original may have used this device as well.[15]

The fact that the earliest and one of the most complete versions of the book are preserved in the Biblioteca Riccardia is itself of interest. The Riccardi were successful

bankers and investors in fifteenth century Florence. The library was founded in the 1690s by combining the collections of the Riccardi and Capponi families; the latter was rich in scientific and philosophical works.[16] Although it is unknown when the works by Leonardo came into the possession of one of these two major Florentine families, they were both in the original inventory of the library taken in 1810. Thus, the provenance of the *Liber Abaci* manuscripts suggests they were of interest and possible use by Florentine banking families. Despite the clues, it is impossible to answer for certain whether the late thirteenth-century copy helped diffuse mathematical knowledge throughout Italy in the late Middle Ages as a text used in early business education.

Little else is known of Leonardo's life in Pisa except that he wrote other mathematical treatises and corresponded with members of Emperor Fredrick II's court. The emperor himself is thought to have read *Liber Abaci*, and, on one of his visits to Italy, granted the famous mathematician an audience.

Leonardo received a pension from the Republic of Pisa in 1241 for "educating its citizens and for his painstaking, dedicated service." Professor Heinz Lueneburg has posted a Latin transcript of the document, which suggests that the city was equally grateful for Fibonacci's teaching (*doctrinum*) and his accounting and valuation (*abbacandis estimationibus et rationibus*).[17] We can thus surmise that much of his life was devoted to teaching mathematics and advising the Pisan government on issues of finance and accounting.

SOURCES AND PREDECESSORS

Leonardo gives considerable credit throughout *Liber Abaci* to the work of Muhammad ibn Mūsì Al Khwārizmī (ca.780–850), the ninth-century court astronomer of Baghdad who wrote the famous treatise *The Algebra*, after which that entire branch of mathematics is named.[18] A few earlier "Algorisms"—as translations and variations on *The Algebra* are called—appear in Europe before *Liber Abaci*. The earliest of these dates to the early or mid-twelfth century.[19] However, these other algorisms closely follow Khwārizmī's work.

Liber Abaci obviously owes an intellectual debt to Al Khwārizmī, not only in his use of Indian numerals but also in the extensive use of algebraic methods. The two works differ significantly in many ways, however. *Liber Abaci* is a much longer book, containing many more problems and solutions and introducing a broader range of practical applications. More important, the two authors treat fundamentally different types of practical problems. For example, most of Al Khwārizmī's nongeometric examples are problems of inheritance: they deal with the complexity of dividing assets among family members and other claimants. A typical question is:

> [A man] leaves two sons and ten dirhems of capital and a demand of ten dirhems against one of the sons, and bequeaths one-fifth of his property and one dirhem to a stranger.[20]

Thus, Al Khwārizmī's focus is not fundamentally commercial but legal, related to legacies and dowries—a class of problems that might in fact have inspired him to write his book. Leonardo takes the solution methods from Al Khwārizmī's *Algebra* and adapts them to problems of dividing the capital from commercial ventures among partners, rather than among family members. Thus, the works share methodological approaches but differ in applications and scope.

An equally important precedent for *Liber Abaci*'s more commercial orientation is the practical tradition of Hindu mathematics. For at least seven centuries before Fibonacci,

Indian mathematicians calculated interest rates and investment growth. One of India's earliest mathematicians, Āryabhata (475–550) presents and solves interest rate problems in his famous book, *Āryabhatīya* (a work otherwise known for its contribution to astronomy).[21] In the seventh century, Bhāskara (ca. 600–680) wrote an extension of and commentary on *Āryabhatīya* that contains practical applications, including partnership share divisions, and the relative pricing of commodities.[22] Sridharacarya's (ca. 870–930) tenth-century *Trisastika*, a work of three hundred verse couplets, contains a few practical interest rate problems and a division of partnership problem.[23]

One particularly interesting example of an Indian mathematical precedent to Leonardo's work is a problem posed by the ninth-century Jain mathematician Mahavira (ca. 800–870) in his *Ganita Sara Sangraha*. Three merchants find a purse lying in the road; the first asserts that the discovery would make him twice as wealthy as the other two combined, the second claims his wealth would triple if he kept the purse, and the third claims his wealth would increase fivefold. Precisely the same problem appears in Chapter 12 of *Liber Abaci*, leaving little doubt that at least certain classical problems in Leonardo's book derive from Indian texts—whether transmitted orally over centuries through the Arab world, or in writing through now-lost Arabic translations of Hindu works. Closer in time to Leonardo's era, and very close in spirit to the financial problems in the Pisan's work, the *Lilivati* of Bhāskarācārya (1114–1185), dates to about 1150 A.D. and, like *Trisastika* and *Āryabhatīya*, contains some loan problems and methods of finding principal and interest.[24] Despite broad parallels, however, none of the earlier Indian works develops a present-value criterion, nor is their financial mathematics particularly sophisticated.

Even in Europe there may have been mathematicians who shared Fibonacci's interest in applied mathematics. Savasorda (d. 1136), a Jewish encyclopedist in twelfth-century Barcelona composed a mathematical treatise on arithmetic and geometry but also solved problems involving price, quantity, and money.[25] Close textual similarities suggest that Fibonacci must have seen Savasorda's work and adapted his methodology of proof, although the work is not cited by the Pisan. Perhaps a follower of Savasorda was one of the unnamed mathematics masters whom Fibonacci visited on his travels.

It is particularly useful to consider the Chinese examples and precedents relating to financial mathematics. One translation and commentary on the most famous ancient Chinese mathematical text, *The Nine Chapters on the Mathematical Art: Companion and Commentary*, identifies some similarities to problems and methods in *Liber Abaci*.[26] The basic text of the *Nine Chapters* dates to the Han Dynasty (200 B.C.–8 A.D.) and before, and it was annotated an augmented many times, first in 263 A.D. By the time of the Song Dynasty—roughly contemporaneous with Fibonacci—the *Nine Chapters* was a standard text used in the preparation of the civil service examinations and represented a body of canonical knowledge mastered by a well-educated man of the time. Much of the book is devoted to problems of geometry and algebra. Not surprisingly, there are several problems dealing with taxes and "fair levies." One interest rate problem requires the calculation of interest earned at 3 percent per month for nine days, and one land lease problem requires the solution of the amount of land, given the known lease payments and rate; neither is remarkable. One potentially relevant example in the Chinese text is a "trips" problem. A merchant carrying grain is taxed at three passes; the reader is told how much exists at the end of the journey and the fraction deducted from him at each stop along the way. This type of problem appears in a sixth- to ninth-century Greek Egyptian papyrus, a seventh-century Armenian text, and Bhāskarācārya's *Lilivati*.[27] Thus, the basic structure of the

problem existed well before Leonardo's time and appeared at both extremes of the Asian continent. There is one other problem in the *Nine Chapters* worth quoting at length:

> Now a businessman invests money in Shu. The interest rate is 10:3. He withdraws 14,000 the first time; 13,000 the next time; 11,000 the next time; 10,000 the next time. After 5 withdrawals, the capital and interest are both exhausted. Tell: the capital and interest, which is each?[28]

This problem is structured in a manner quite similar to some of the interest rate problems solved by Fibonacci. The reference to the city of Shu suggests the problem dates to the Qin or Han dynasty. Thus, it represents an early and unique precedent to Fibonacci's most important work. Oddly enough, it is an isolated problem in the *Nine Chapters*, and there is no historical record of banking in the Han—with the exception of pawn shop lending—nor any similar mathematical problem known from Indian or Arabic mathematical texts.

Although we will never know all of Fibonacci's sources for mathematical methods and problems, his acknowledged Arabic precedents and the likely multiple Indian precedents provide at least a conceptual foundation for his work. The singular Chinese example quoted above suggests the existence of a mathematical tradition of loan calculations which did not survive in other written records that Fibonacci might have seen. Despite this one case, however, no previous work of algebra or applied mathematics comes close to the comprehensive analysis of business and financial transactions of *Liber Abaci*, and only one—the *Nine Chapters*—provides a comparable text for the actual teaching of applied mathematics. While *Liber Abaci* is structured like previous algorisms—with the number system first, followed by the introduction of basic operations and then fractions, a large part of the book is devoted to progressively more complex word problems. In chapter after chapter, Fibonacci introduces a simple problem and its solution and then provides increasingly sophisticated examples that use the same method of solution and require applications of tools mastered in previous chapters.

Let us now turn to some of *Liber Abaci*'s key contributions.

FRACTIONS AND THE RULE OF THREE

After an initial discussion of arithmetic operations in the first four chapters, chapters 5 and 6 of *Liber Abaci* introduce fractions and mixed numbers. Leonardo's fractions are a bit different from the modern form: they are factored. For example, the number 5.123 would be written $\frac{3}{10}\ \frac{2}{10}\ \frac{1}{10}\ 5$; that is, the denominator of the leftmost fraction is the product of all denominator values that precede it. This method was particularly useful for calculations involving nondecimal monetary and quantity systems. For example, monetary units based upon the Roman system used denari, soldi, and lira, with 12 denari to the soldo and 20 soldi to the lira. In this notation, the units of each denomination can be preserved in the fraction—a price of five lira, six soldi, and four denari can be represented as $\frac{4}{12}\ \frac{6}{20}\ 5$. Units of weight and measure can be even more complex. According to Leonardo,

> Pisan hundredweights . . . have in themselves one hundred parts each of which is called a roll, and each roll contains 12 ounces, and each of which weighs ½ 39 pennyweights; and each pennyweight contains 6 carobs and a carob is 4 grains of corn.[29]

Chapter 8 is entitled "On Finding the Value of Merchandise by the Principal Method," and it begins the application of the new mathematics to commercial problems.

The first problem Fibonacci addresses is how to determine an unknown price from a given quantity of merchandise when the price per unit is known: suppose 100 rolls costs 40 lira, how much would five rolls cost? He offers the solution through a diagram $\begin{bmatrix} 40 & 100 \\ ? & 5 \end{bmatrix}$ and the solution as (40 * 5)/100.

This simple solution is generally called the "Rule of Three" and is one of the oldest algebraic tools in mathematics. The Rule of Three appears in the *Āryabhatīya*, and is extended and elaborated upon in Bhāskara's commentaries, in which he applies it to problems quite similar to those analyzed by Leonardo.[30] The Rule of Three also appears in *The Nine Chapters*.

Leonardo uses the Rule of Three with increasingly complex quantities and currencies, applying it to examples drawn from trade around the Mediterranean. Goods include hundredweights of hides, hundredpounds of pepper, tons of Pisan cheese, rools of saffron, nutmeg, and cinnamon, meters of oil, sestario of corn, canes of cloth, oil from Constantinople. Currencies include denari, massamutini, bezants, tareni. Leonardo colorfully describes transactions in Sicily, the Barbary Coast, Syria, Alexandria, Florence, Genoa, Messina, and Barcelona. The prosaic nature of each of these problems speaks of the practical import and the likely appeal of the book to merchants. For example, for a Pisan cloth merchant who trades in Syrian damask and competes with a Genoese merchant, it would have been useful to be able to translate across three different units of length:

> A Pisan cane is 10 palms or four arms; however, a Genoese cane is said to be 9 palms. And furthermore the canes of Provence and Sicily and Syria and Constantinople are the same measure.[31]

Or for traders of raw cotton here is a useful problem:

> One has near Sicily a certain ship laden with 11 hundredweights and 47 rolls of cotton, and one wishes to convert them to packs; because 1/3 1 hundredweights of cotton . . . is one pack, then four hundredweight of cotton are 3 packs and four rolls of cotton are 3 rolls of a pack; you write down in the problem the 11 hundredweights and 47 rolls , that is 1147 rolls below the 4 rolls of cotton and you will multiply the 1147 by 3 and you divide by the 4; the quotient will be 1/4 860 rolls of a pack.[32]

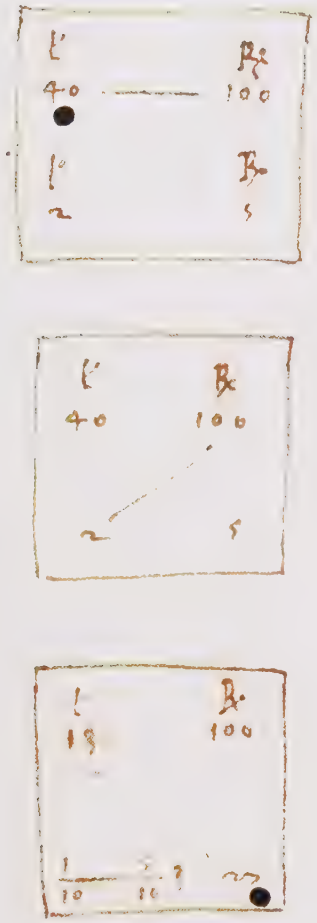
Following this basic technology, Fibonacci extends the problems to those of exchange between two goods. For example:

> It is proposed that 7 rolls of pepper are worth 4 bezants and 9 pounds of saffron are worth 11 bezants, and it is sought how much saffron will be had for 23 rolls of pepper.[33]

Here, the diagram is expanded to three columns[34]:

$$\begin{bmatrix} \textit{saffron} & \textit{bezants} & \textit{pepper} \\ \left[\frac{2}{7}\ \frac{8}{11} 10\right] & 4 & 7 \\ 9 & 11 & 23 \end{bmatrix}$$

It shows how to multiply 23 * 4 * 9 and divide by the diagonal elements 7 * 11 to arrive at the solution. This pattern can thus be applied to any longer sequence of intermediate



Detail of the Application of the Rule of Three, from Liber Abaci. Fifteenth-century copy of thirteenth-century Latin text. Leonardo's book uses marginal diagrams to demonstrate rules of arithmetic and solution methods for algebraic problems.

trades to establish no-arbitrage relationships among commodities in a market. This solution is essentially the application of the "Rule of Five" that Bhāskara and later Indian mathematicians developed to express price/quantity relationships across several goods. The horizontal expression of the Rule of Five in Western algorisms is orthogonal to the vertical orientation of the Indian application of the rule.[35] Thus, either an intermediate Arabic manuscript changed the algorithm or the solution method was transmitted to the West conceptually, without a written Indian model.

Although the mathematics of the Rules of Three and Five are trivial to us eight hundred years later, they were unquestionably a vital quantitative tool of the arbitrageur of the thirteenth century. Italian merchants were buying saffron and pepper from their Arab counterparts, who were the primary intermediaries in the spice trade. Merchants who could not calculate the relative value of saffron and pepper in the market—or perhaps could only do so approximately, or with difficulty—were at an extreme disadvantage in trade and negotiation. Just as today's hedge funds use sophisticated, quantitative models to rapidly calculate the relative price of two mortgage-backed securities, and then use these calculations to establish a long or a short position if they detect a mispricing, so must thirteenth-century Pisan merchants, bartering in a Damascus *suk* with spice traders, have used a rapid series of arithmetic calculations to detect and exploit deviations from price parity and to barter their way toward profit. It is not surprising that the knowledge of the Rule of Three extended in antiquity along trade routes.

FOREIGN EXCHANGE AND COINAGE

Leonardo also applies the Rules of Three and Five to problems of currency exchange, an area in which the practical demand for a guide to monetary conversions must have been considerable. Peter Spufford charts the evolution of a patchwork of currencies in medieval Europe.[36] Italy had the highest number of currencies, with twenty-eight different cities issuing coins during the Middle Ages—Tuscany alone issued seven. Most currencies, but not all, were based on the Roman system of "*d*,*s*,*l*"—denari, soldi, lire—known in England as the pounds, shilling, and pence system. However the relative value and metallic composition of the coins varied considerably by year and region. The varieties of currency created business for moneychangers, "*Banche Del Giro*," where monetary systems came into contact, and these moneychangers and their customers needed tools for calculation.

Before Fibonacci, the common method for exchange arithmetic was the abacus or other versions based on moving markers in grooves or along scored lines on a table. As such, the algorithmic solution to an exchange problem was separated from the written expression of the problem; Arabic numerals allowed the solution to be calculated on paper based upon the written statement of the problem. This almost certainly altered and improved the way moneychangers could model and analyze relative values of multiple currencies rapidly. It is straightforward to be able to accurately calculate, one at a time, each in a sequence of monetary exchanges; it is more challenging to set up a series of equations of relative value and to place algebraic bounds on how much any currency is worth in terms of another. Reading *Liber Abaci* one has the sense that Italian merchants of the thirteenth century operated in a world of complete relativism. With no central government, no dominant currency, and competing faiths and heresies, even the value of goods was expressed abstractly only in relation to other items. While many of Leonardo's examples use money as a unit of calculation, the currencies vary arbitrarily from example to example, almost as if to stress the flexibility and applicability of his algebraic approach.

Indeed, medieval money was not quite money in the modern sense. Transactions might be expressed in a certain currency, or unit of account, but the quantity of physical coinage corresponding to that unit could vary over time, as governments regularly debased and revalued their currencies. One of the attractive things about a pure gold coin, like the Florentine florin first minted in 1252, is that it could serve simultaneously as a unit of account and of transaction, with a 1:1 numeric correspondence. Most silver coinage contained at least some copper, which debased the value relative to bullion and caused it to fluctuate through time. It is thus not surprising that Leonardo's monetary analysis goes beyond currency conversions into problems of minting and alloying of money. An entire chapter of *Liber Abaci* is devoted to the methods for minting coins of silver and copper.

Certain cities, including Pisa, had imperial rights to coin money, and mints in these cities operated by striking coins from bullion brought to them from the public and the private sectors. A merchant who wished to turn a quantity of metal (perhaps even old coins) into currency would pay a *seigniorage* fee to the mint for the production of coin. During much of Leonardo's lifetime, the Pisan penny was pegged to the value of the Lucchese penny and together they became the standard monetary unit in Tuscany, with little evidence of debasement or changes in the metallic composition. In contrast, also during Leonardo's lifetime, the currency of northern Italy underwent a major monetary change: cities began to mint large silver coins called *grossi*. In the late 1220s (around the time of the second edition of *Liber Abaci*) Lucca introduced a coin with a high silver content worth 12 *denari*. This followed the introduction of *grossi* by Genoa in 1172 and by Venice in 1192. Leonardo does not specifically address the relative value of *grossi* and *denari* on his chapter on minting of coin; instead he avoids the topic of specific currencies in favor of a more abstract discussion of the general methods of calculation and evaluation of relative proportions of silver and copper in coins. Presumably the methodology developed in *Liber Abaci* was useful not only to the master of the Pisa mint but perhaps also to merchants who delivered metal for coinage, and paid the seigniorage.

Finance and Interest Rate Problems

Most of the pure finance problems in *Liber Abaci* are in the twelfth chapter—as is the famous Fibonacci series example—and fall into four general types. The first concerns the fair distribution of profits from joint business ventures when contributions have been unequal and made at different times, and in different currencies or goods, and also when business partners borrow from each other. The second type concerns the calculation of profits from a sequence of business trips in which profit and expense or withdrawal of capital occurs at each stop. The third is the calculation of future values from investments made with banking houses. The fourth concerns present value analysis as we now think of it, including specifically the difference between annual and quarterly compound interest.

DIVISION OF PROFITS

The mathematics of dividing profits from joint business ventures was obviously relevant to Italian merchants of the thirteenth century. The basic business unit used to finance many trade ventures in northern Italy was the *commenda* contract between an investor and his traveling partner: the former (*commendator*) invested capital and the latter (*tractator*) invested labor. John H. Pryor's study of *commenda* from the twelfth century describes two kinds of contract, unilateral and bilateral; the former provided limited liability but smaller profit to the *tractator*, and the latter shared the potential losses equally between the con-

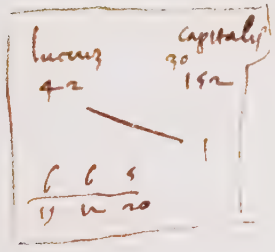
tracting parties.[37] In the standard unilateral *commenda*, the *commendator* would transfer capital to the *tractator* for the duration of the voyage (or term of the contract) and would take three-fourths of the profit.

Much of what is known about *commenda* has been gleaned from studies of notarial documents in Italian and French archives, and Pisan records are among the oldest. Pisa's *Constitutum Usus* (1156) is the earliest surviving municipal document specifying the conditions of the *commenda* contract.[38] The unilateral *commenda* in Pisa was very much like the contract described by Leonardo, writing forty-six years after the statues, in a problem of division of profits. The problem "On Companies," is worth quoting at length:

> Whenever . . . any profit of an association is divided among its members we must show how the same must be done according to the abovewritten method of negotiation. . . . We then propose this of a certain company which has in its association 152 pounds, for which the profit is 56 pounds, and is sought how much of the same profit each of its members must be paid in pounds. First, indeed, according to Pisan custom, we must put aside one fourth of the abovewritten profit [apparently for the *tractator*]; after this is dealt with, there remain 42 pounds. Truly if you wish to find this according to the popular method, you will find the rule of 152, that is $\frac{1}{8}\ \frac{0}{19}$; you divide the profit, namely the 42 pounds; by 8; the quotient will be 5 pounds and 5 soldi which are 105 soldi, which you divide by the 19; the quotient will be 5 soldi and $\frac{6}{19}$ 6 denari. If you wish to find by the aforewritten rule how much will result . . . for profit from 13 pounds in the association, then you do this: multiply the 13 by the profit prortion in one pound, namely by 5 soldi and 6 denari . . . there will be 3 pounds and 11 soldi and $\frac{2}{19}$ 10 denari.[39]

profit	*capital*
$\frac{6}{19}\ \frac{6}{12}\ \frac{5}{20}$	152
10	1

profit	*capital*
42	152
$\frac{2}{19}\ \frac{10}{12}\ \frac{11}{20}$ 3	13



Division of Corporate Profits, from Liber Abaci. *Fifteenth-century copy of thirteenth-century Latin text.* Fibonacci demonstrates how to calculate investment profits from an enterprise, using the rule of three to determine the return per investment share.

Fibonacci's problem provides a fascinating example of how *commenda* were used. Although the *tractator* profits were divided according to Pisan custom, the *commendator* shares could be divided among several investors whose association is termed a *societas*. Fibonacci develops a general approach for dividing the profits from a *societas* according to the proportion of contributed capital. His approach is now the familiar definition of a rate of return on a unit of capital which is then scaled by the amount invested. Robert Lopez argues that *societas* and the *commenda* contracts were the original European forms of business association from which modern partnership and corporations ultimately developed. Consequently, the *commenda* example and related problems addressed by Fibonacci in *Liber Abaci* were significant early contributions to precorporate financial economics. Interestingly, a Chinese mathematical text from 1247 A.D., Qin Jiushao's *Mathematical Treatise in Nine Sections*, poses a problem of four merchants who form a partnership to trade in the South Sea.[40] The Chinese problem suggests that this kind of commercial mathematics might have had wide currency in the thirteenth century.

TRAVELING MERCHANT PROBLEMS

The second type of financial problem is a set of "traveling merchant" examples, akin to accounting calculations for profits obtained in a series of trips to trading cities. The first example is:

> A certain man proceeded to Lucca on business to make a profit [and] doubled his money, and he spent there 12 denari. He then left and went through Florence; he there doubled his money, and spent 12 denari. Then he returned to Pisa, doubled

his money and it is proposed that he had nothing left. It is sought how much he had at the beginning.[41]

This is something like the taxation problems in the *Nine Chapters*; Leonardo proposes an ingenious solution. Since capital doubles at each stop, the discount factor for the third cash flow (in Pisa) is $\frac{1}{2}\ \frac{1}{2}\ \frac{1}{2}$. He multiplies the periodic cash flow of 12 denari times a discount factor that is the sum of the individual discount factors for each trip, i.e., $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}$. The solution is 10.5 denari. The discount factor effectively reduces the individual cash flows back to the point in time before the man reached Lucca. This approach can be generalized to allow for different cash flows at different stages of the trip, a longer sequence of trips, different rates of return at each stop, or a terminal cash flow. In the twenty examples that follow the Lucca-Florence-Pisa problem, Leonardo presents and solves increasingly complex versions with various unknown elements. For example, one version of the problem specifies the beginning value and requires that the number of trips be found: "A certain man had 13 bezants, and with it made trips, I know not how many, and in each trip he made double and he spent 14 bezants. It is sought how many were his trips."[42] This and other problems demonstrate the versatility of his discounting method. They also provide a framework for the explicit introduction of the dimension of time and the foundation for what we now consider finance.

INTEREST RATE AND BANKING PROBLEMS

Immediately following the trip problems, Fibonacci poses and solves a series of banking problems. Each of these follows the pattern established by the trip example—the capital increases by some percentage at each stage, and some amount is deducted. For example:

> A man placed 100 pounds at a certain [banking] house for 4 denari per pound per month interest and he took back each year a payment of 30 pounds. One must compute in each year the 30 pounds reduction of capital and the profit on the said 30 pounds. It is sought how many years, months, days, and hours he will hold money in the house.[43]

This, of course, resembles the problem of the man who invested in Shu. Fibonacci explains that the solution is found by using the same techniques developed in the trips section. Intervals of time replace the sequence of towns visited and thus a time-series of returns and cash draw-downs can be evaluated. Once the method of trips has been mastered, then it is straightforward to construct a multiperiod discount factor and apply it to the periodic payment of 30 pounds—although in this problem the trick is to determine the number of time periods used to construct the factor. A modern-day problem solver might use logarithms to address the problem of the nth root for an unknown n, but Fibonacci lived long before the invention of logarithms. Instead, he solves it by brute force over three pages, working forward from one period to two periods and so on, until he comes to the answer of 6 years, 8 days and $\frac{1}{2}\ \frac{3}{9}$ 5 hours. The sophistication represented by this problem alone is unmatched in the history of financial analysis, even in the *Nine Chapters*. Although the mathematics of interest rates had a three-thousand-year history before Fibonacci, his remarkable exposition and development of multiperiod discounting is a quantum leap beyond his predecessors.

Eleven banking-house problems follow this initial mathematical tour de force. Each of them contains some unknown value; either the future value, the present value, the rate of

interest, the duration of the loan, or the periodic dividend that is withdrawn. Fibonacci provides models to solve each unknown, basing all of them on the previously introduced trip paradigm.

It is surprising to find an overt description of the charging of interest by bankers in the thirteenth century, given the ecclesiastical proscription against usury. John Munro has argued convincingly that while Church doctrine had long forbidden usury, vigorous institutional attacks on the charging of interest began in earnest in the early thirteenth century and were a major impetus for the development of *census* and *rentes* and perpetual bond contracts. These developments all circumvented the ecclesiastical definition of loans.[44] *Liber Abaci* was written shortly before the formation of the Franciscan and Dominican orders (1206 and 1216, respectively), which were at the vanguard of the fight against usury. The Church's attack on the charging of interest was, in fact, an attack on exactly the kinds of operations described and analyzed in Leonardo's book.[45]

PRESENT VALUE ANALYSIS

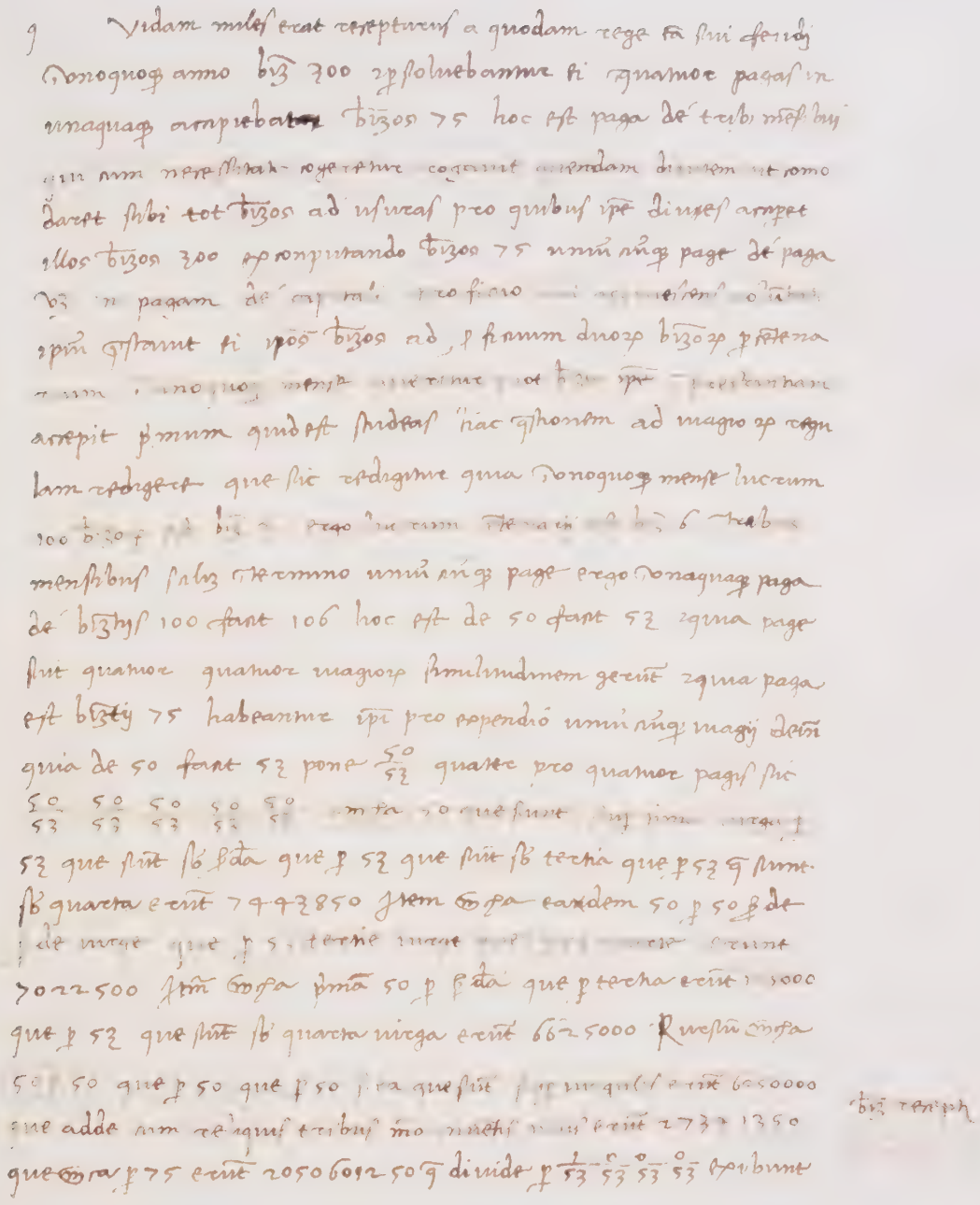
The most sophisticated of Fibonacci's interest rate problems is "On a Soldier Receiving Three Hundred Bezants for his Fief." In it, a soldier is granted by the king an annuity of 300 bezants per year, paid in quarterly installments of 75 bezants. The king alters the payment schedule to an annual year-end payment of 300. The soldier is able to earn 2 bezants on one hundred per month (over each quarter) on his investment. How much is his effective compensation after the terms of the annuity have changed? To solve this, Fibonacci explains:

> First indeed you strive to reduce this problem to the method of trips and it is reduced thus . . . because there are 4 payments, 4 trips are similarly carried, and because each payment is 75 bezants, this is had for the expense of each trip. Next because 53 is made from 50, you put $\frac{50}{53}$ four times for the four payments, thus $\frac{50}{53}\ \frac{50}{53}\ \frac{50}{53}\ \frac{50}{53}$.[46]

The product of these ratios is used to discount a payment by four periods (or trips). Notice that Fibonacci's novel fraction expression allows each term to be successively discounted by one more period. The discounted annual value of the 300 bezants paid in the last period is 259 and change. As before, Fibonacci explains how to construct a multiperiod discount factor from the product of the reciprocals of the periodic growth rate of an investment, using the model developed from mercantile trips in which a percentage profit is realized at each city. In this problem, he explicitly quantifies the difference in the value of two contracts due to the timing of the cash flows alone. As such, this particular example marks the discovery of one of the most important tools in the mathematics of finance: an analysis that explicitly ranks different cash flow streams based upon their present value. Unlike any of his previous problems, this one (and its solution) appears to have no earlier precedent in mathematical history—not even Chinese mathematical history.

INSTITUTIONAL AND COMMERCIAL CONTEXT

The soldier's present value problem testifies to the importance in 1202 of the mathematics of time-value discounting when *Liber Abaci* was written. However, over the next few centuries its significance to governmental and commercial transactions became central. With the growth of international trade—and warfare—in the late Middle Ages, the need for long-distance monetary transfers increased. Chinese merchants had solved this problem



Detail of the problem "On a Soldier Receiving Three Hundred Bezants for his Fief," from Liber Abaci. *Fifteenth-century copy of thirteenth-century Latin text.* This problem is the first to mathematically compare the present value of two differing cash streams and to quantify the difference in terms of present value.

centuries earlier with the use of *feiqian*, or "flying cash," remittance certificates issued by government institutions. Arab merchants in Fibonacci's time used an instrument much like a modern personal check for paper remittance. Neither of these explicitly involved a discount for the time-value of money. Early European money transfers—bills of exchange—did. Any distant remittance involved a time interval due to travel, and compensation for the use of the money over that period was natural, so bills of exchange were typically discounted to compensate for forgone interest revenue—essentially as shown in the example of "The Soldier Receiving Three Hundred Bezants for his Fief." Thus, bills of exchange were also interest rate instruments.[47] Both the early thirteenth-century date and the Levantine origin of medieval bills of exchange form an interesting parallel to the publication date and Eastern influences of *Liber Abaci*. Were the mathematical tools for present value imported to Italy along with bills of exchange and Arabic numerals? Or did the technological innovation of using bills of exchange as debt securities (called "dry-exchange" by medieval practitioners) stimulate mathematical work on the time-value of money? In all likelihood, it was a fertile interplay between commerce and mathematical advancement, and Leonardo of Pisa was at its geographical and intellectual center.

Another key innovation occurred in northern Italy around Fibonacci's lifetime: the creation of long-term government debt. Venice and Genoa both began to issue forced loans to her wealthy citizens in the late twelfth century. In 1171 Venice issued a mandatory 5 percent loan to all citizens of the Republic to finance the construction of a fleet to fight Byzantium.[48] Out of this and successive loans called *prestiti*, a regular market for government debt developed in Venice by the mid-thirteenth century. The consolidation of the Venetian debt by decree in 1262 institutionalized the funding of municipal debt and gave birth to the widespread modern practice of financing the government through a national debt.

The roots of this debt revolution can be found in the financial records of Pisa itself. Pisa in Leonardo's time regularly made long-term debt commitments to creditors, promising the perpetual flow of revenues from specific sources to amortize a debt. Just such a contract was made with a creditor of the commune in 1173.[49] The public finances of the commune became increasingly complex during the thirteenth century. Pisan governors (*podesta*) began to raise money through capitalization of taxation and monopoly rights.[50] The economic decision to alienate a stream of future cash flows in return for a current lump-sum payment is essentially a present value consideration. There is no doubt that the mathematical techniques in *Liber Abaci* would have allowed the *podesta* to quantify these decisions in a manner not feasible before Fibonacci's work. In fact, the annuity granted to Fibonacci late in his life for service to the state suggests that he may have had a hand in advising these financial contracts.

The technology of present value in *Liber Abaci* would also have served the analysis of private commercial transactions. Consider the futures contracts quoted in neighboring Pistoia from at least the beginning of the thirteenth century. From 1201 to 1210, contracts for perpetual delivery of a staio of wheat sold for a median price of 2.80 lira—a period when the spot price of a staio sold for one-quarter of a lira. Without a mathematical method for discounting future deliveries, how did market participants determine the present value of such contract?[51] How were speculators able to arbitrage the relative prices of farmland and futures contracts? Indeed, did the capacity to discount future values exist in northern Italy before Fibonacci, or did his mathematics make futures and complex fixed income contracts possible? Ultimately, it is difficult to disentangle the causal relationship between the commercial problems of the day and the mathematical methods for

solving them. Almost certainly, as is true today, there was a dynamic relationship between the analytical framework and the market. Mathematicians then, as now, must have been motivated by problems in the world around them, and, in turn, their solutions engendered new advances in financial engineering.

DID FINANCE INFLUENCE THE MATHEMATICS OF INFINITE SERIES OR VICE-VERSA?

The famous Fibonacci series problem is posed late in chapter 12, not as part of a series of related problems but after a problem on finding numbers equal to the sum of their factors and before an algebra problem about four men with money. Is there any connection between the famous series and the commercial problems in the chapter? Certainly Chapter 12 is full of examples of compound growth from period to period—in particular, of proportional increases in capital. The arithmetic of constructing a sequence of future values establishes a basis for considering a number of other, curious, infinite series. One particularly interesting example in chapter 12 is about the problem of doubling grains of wheat on a chessboard and summing the result. Starting with only two grains and progressing through a chessboard of 64 squares by doubling the number of grains in each leads to a quantity that is so great that "the number of ships [required to carry it] is effectively infinite and uncountable."[52] Fibonacci marvels at how a simple growth algorithm applied to the well-known and finite pattern of a chessboard leads to imagining a vast, nearly infinite magnitude. This example suggests that Fibonacci's study of infinite series may actually have developed as an extension of his analyses of compounding rates of return in finance problems.

After *Liber Abaci*

No matter how revolutionary, Leonardo's book did not advance Pisa to the economic forefront of competing thirteenth-century Tuscan communes. Although Pisa grew significantly during this period, it gradually lost out to other cities in the competition for the Levantine trade. Pisan merchants increasingly turned to the North African colonies and trade with France and Spain, leaving trade with Constantinople and the Holy Land to her rivals Venice and Genoa. Larger political forces trumped any commercial or technological advantage potentially enjoyed as a result of Leonardo's writing and teaching.

One enduring aspect of Fibonacci's legacy is business education. During the centuries following the writing of *Liber Abaci*, the number of commercial arithmetic books increased dramatically in Italy and France.[53] Hundreds of handwritten and printed arithmetic books have survived from the European Renaissance, and many of them draw directly or indirectly from Leonardo's book. Undoubtedly beginning with Leonardo's own efforts to educate the citizens of Pisa in the thirteenth century, Italian businessmen learned techniques of valuation and discounting according to his methods. When fifteenth-century Florentine bankers extended their lending operations throughout Europe, they already had a centuries-long Italian tradition of financial mathematics upon which to draw.[54] To see how the mathematics of finance developed after Fibonacci, consider two of the most important examples of his legacy of arithmetic writing and education: one from the fifteenth century and another from the sixteenth century. The earliest extant printed commercial arithmetic is the *Treviso Arithmetic* of 1478, a volume of commercial problems written in the Venetian dialect, apparently used widely as a text for Renaissance Italian "Reckoning" schools.[55] *Liber Abaci* and the *Treviso* are clearly written in

20 et 20	fiunt	40
20	30	50
20	40	60
20	50	70
20	60	80
20	70	90
20	80	100
20	90	110
20	100	120
30 et 30	fiunt	60
30	40	70
30	50	80
30	60	90
30	70	100
30	80	110
30	90	120
40 et 40	fiunt	80
40	50	90
40	60	100
40	70	110
40	80	120
40	90	130
50 et 50	fiunt	100
50	60	110
50	70	120
50	80	130
50	90	140
60 et 60	fiunt	120
60	70	130
60	80	140
60	90	150
60	100	160
70 et 70	fiunt	140
70	80	150
70	90	160
80 et 80	fiunt	160
80	90	170
90 et 90	fiunt	180

Explicaunt cunctiones

inaquunt multiplicationes

de binario		
2 vias 2	fiunt	4
2	3	6
2	4	8
2	5	10
2	6	12
2	7	14
2	8	16
2	9	18
2	10	20
de tre nario		
3 vias 4	fiunt	12
3	5	15
3	6	18
3	7	21
3	8	24
3	9	27
3	10	30
de quatre nario		
4	5	20
4	6	24
4	7	28
4	8	32
4	9	36
4	10	40
de quinario		
5	6	30
5	7	35
5	8	40
5	9	45
5	10	50
de senario		
6	7	42
6	8	48
6	9	50
6	10	60
de septenario		
7	8	56
7	9	63
7	10	70
de octonario		
8	9	72
8	10	80

de nouenario		
9	10	90
de decenario		
10	10	100
10	20	200
1	1	1
2	2	4
3	3	9
4	4	16
5	5	25
6	6	36
7	7	49
8	8	64
9	9	81
10	10	100
2	20	40
3	30	90
4	40	160
5	50	250
6	60	360
7	70	490
8	80	640
9	90	810
10	100	1000
2	30	60
2	40	80
2	50	100
2	60	120
2	70	140
2	80	160
2	90	180
2	100	200
	40	120
3	50	150
3	60	180
3	70	210
3	80	240
3	90	270
3	100	300

Et sic de ina p[illegible]

Explicaunt multiplicationes

10000000	17316764	29987033	41 terme en progression comme 100 à 144..
10400000	18009435	31186514	
10816000	18729812	32433975	
11248640	19479000	33731334	
11698585	20258165	35080587	
12166529	21068491	36483810	
12953190	21911231	37943163	
13159317	22787580	39460889	
13685690	23699187	41039325	
14231311	24647155	42680898	
14802442	25633041	44388134	
15394540	26658363	46163659	
16010322	27734697	48010206	
17650735	28833685		

Si tu diuises l'vn de ces termes quelconque par le premier, le quotient monstrera ce que le Roy acquite de 100 de principal ceste foyre que signifia l'ordre du terme diuisé. Et par le consequent si ce quotient est leué de 5, le reste denotera ce qu'il a payé d'interest. De là s'ensuit aussi que si de tous les termes ainsi diuisez, tu adioustes les quotiens, la somme d'iceux montera tout ce que le Roy paye du 100 de principal en 41 payements. Ou bien si tu adioustes tous les termes d'icelle progression, la somme d'iceux diuisée par le premier, denotera mesmement ce que le Roy a payé du 100 de principal en 41 termes. Si donc d'vne part ou autre il vient 100, iustement, ces deux conditions sont egales : si plus ceste cy est meilleure pour les banquiers si moins au contraire. *L'vsage d'icelle table.*

Apres donc auoir adiousté les 41 termes d'icelle progression, i'ay trouué 998265338 : laquelle

Above: *Table of compound interest, from the 1637 second edition of* L'Arithmetique, *originally written by Jean Trenchant in 1558.* Trenchant builds on Leonardo's methods of present value calculations to solve more sophisticated financial problems. He was the apparently the first to calculate a table of compound growth.

Opposite: Fibonacci's table of products in *Liber Abaci* is arguably the earliest Arabic numeral multiplication table in Western mathematics. As such, it was an important financial tool for rapid calculation.

the same style, with an introduction to arithmetic operations, followed by chapters devoted to such topics as partnerships and division of profits, applications of ratios to trade and exchange, and metallurgy and coinage. Absent in the *Treviso*, however, are interest-rate problems and methods of discount, perhaps reflecting the influence of usury laws in the preceding centuries that curtailed their explicit role in mathematical education.[56] Italians used discounting technology widely at this time, but apparently it would not do to include such examples in a published book.

By contrast, a book published a century later in Lyons draws heavily on the financial technology of *Liber Abaci*, and in fact demonstrates the fundamental role in European finance played by present value analysis. *L'Arithmetique*, written by Jean Trenchant in 1558, follows the general structure of earlier and contemporary arithmetics. However, unlike the author of the *Treviso*, Trenchant also devotes a major section of his book to interest rate and present value problems. Trenchant poses one problem in particular that clearly builds on Fibonacci's work but is an actual case rather than simply an illustrative example.

> In the year 1555, King Henry, to conduct the war, took money from bankers at the rate of 4 percent per fair. That is better terms for them than 16 percent per year. In this same year before the fair of Toussaints, he received by the hands of certain bankers the sum of 3,945,941 ecus and more, which they called "Le Grand Party" on the condition that he will pay interest at 5 percent per fair for forty-one fairs after which he will be finished. Which of these conditions is better for the bankers?[57]

The question is posed whether Henry's perpetuity at 4 percent per quarter is worth more or less than his 5 percent per quarter annuity for forty-one quarters. Here, three and a half centuries after Leonardo, mathematicians are using methods developed in *Liber Abaci* to finance the struggle for control of Europe. Trenchant, in fact, may have been one of the mathematicians consulted in the structuring and valuation of these loans; he lived in Lyons where the financing took place.

Trenchant's solution is an elegant one. Rather than calculating the present value of the annuity and the perpetuity separately and comparing the two, he takes the incremental cash flow generated by the annuity over the forty-one quarters and calculates the future value of that stream, under the assumption that each extra 1 percent payment per quarter is loaned at interest until the end of the period. He observes that if the future value of this cumulative residual is less than the value of a perpetuity forty-one quarters hence, then the 4 percent perpetuity is worth more than the annuity.

Earlier in his book he develops methods to calculate geometric progressions and uses them on a sequence of forty-one numbers representing the future value of the forty-one incremental cash flows due from the annuity. He then sums them and scales the value to the initial investment, allowing a comparison in percentage terms to any given initial investment in the perpetuity. He finds that the annuity is worth only 99.2 percent of the perpetuity, and thus concludes that the first deal is better for the bankers than the second.

Trenchant's analysis demonstrates how important present value analysis had become in Europe by the sixteenth century. Over the centuries following Leonardo's work, the present value method evolved from being the tool of an Italian commune seeking to reduce its pension expenses, to a critical factor in financing the defense of France. Unlike Leonardo, who relied upon the analogy to trips but made a major contribution to the mathematics of

infinite series, Trenchant's exposition of present value analysis was based directly upon solutions to geometric series. In fact, Trenchant's development of present value analysis is more complete than Fibonacci's, considering as it does the difference between an annuity and a perpetuity. His book was the first to publish a table of growth factors for present value calculation.

Conclusion

History proceeds by broad cultural trends, salient political and military events, and population movements, as well as by discoveries and contributions by individuals. Ultimately there is no way to directly measure Leonardo's personal influence on later developments in finance, however there is no doubt that the mathematical tools in his book, whether directly applied or indirectly adapted, eventually became the foundation for widespread financial innovation. Whenever any modern financier makes a present value calculation or compares the relative merits of two financial securities, he or she owes a debt to Leonardo of Pisa.

It is of course, tempting to speculate beyond the known facts. The outline of Leonardo's life points to the possibility that he was more directly involved in the world of finance. As an advisor to the government of Pisa, Leonardo would certainly have been consulted directly on issues of municipal finance, including perhaps the issuance of public debt. He may even have been part of the broader development of municipal debt financing in the northern Italian city-states during his lifetime, if not as a financial engineer then perhaps as an analyst of the relative values of these early debt securities. Unfortunately, there are no records of his direct involvement with either.

Perhaps he was most influential in his role as an educator. The financial skills taught in *Liber Abaci* represent a quantum leap above existing knowledge. They would have provided an important relative advantage to a clever finance minister, a canny banker, or an enterprising merchant of the time, whether in Pisa or a neighboring Italian city-state. It may not be purely coincidental that the oldest extant copy of *Liber Abaci* is in the Biblioteca Riccardiana in Florence, the city where modern banking was born.

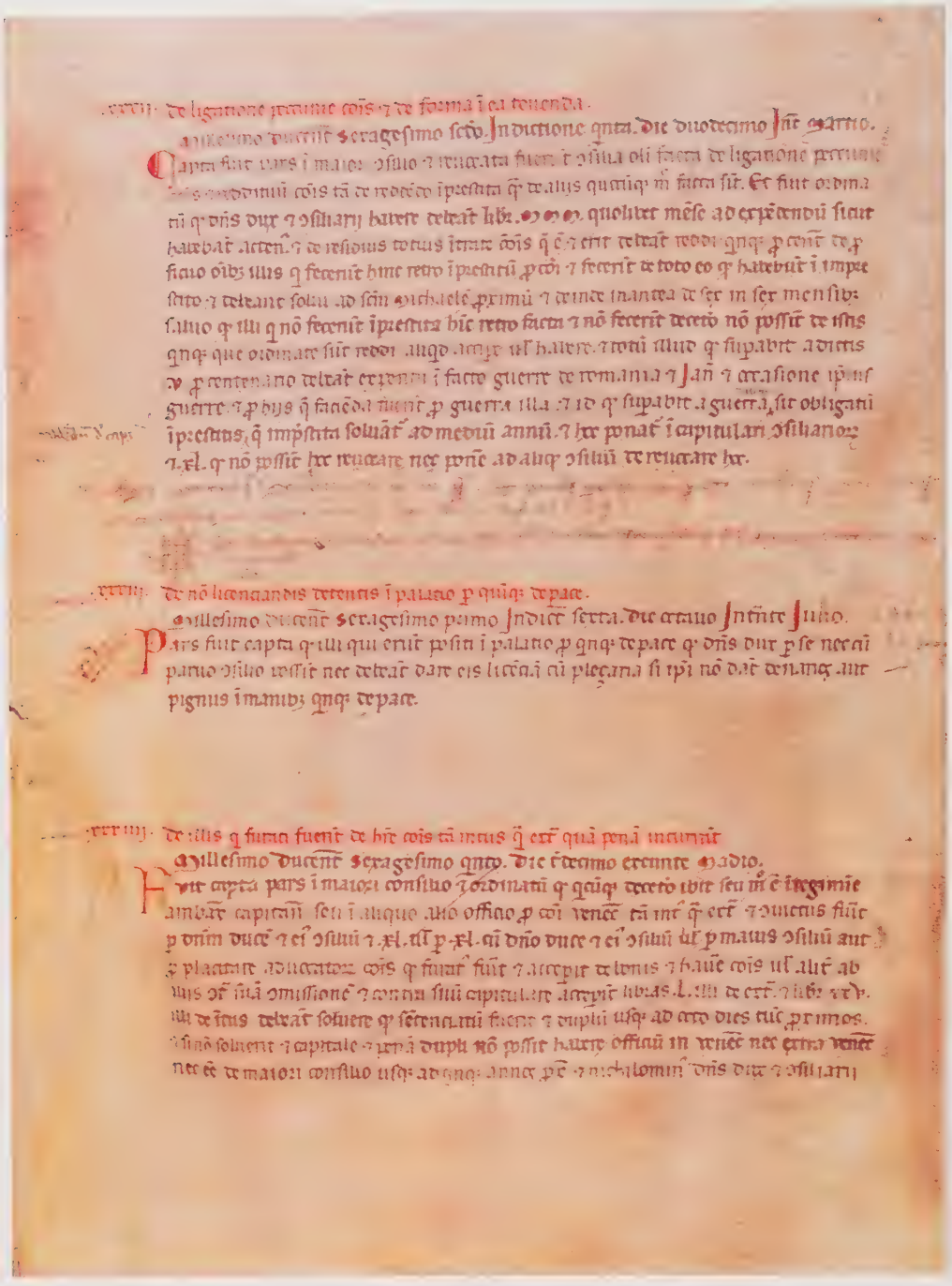
8

Bonds and Government Debt in Italian City-States, 1250–1650

LUCIANO PEZZOLO

On March 12, 1262, Venice was involved in a difficult war against her major rivals in the Mediterranean Sea, the Byzantine emperor Michael Palaeologus and his Genoese allies. The previous year the Venetians had lost important bases in Greece, and the new naval campaign, which would prove victorious, was being carried out resolutely. The military pressure, on the one hand, and the urgent need to create order in public finance, on the other, led the Great Council—the most important organism of the Venetian government—to issue a decree that has come to be regarded as a financial innovation.[1] The decree permitted the government to spend for its ordinary needs up to 3,000 lire (*ad grossos*) a month; spending beyond that had to be used to pay 5 percent interest to those from whom the government had borrowed money. The interest had to be paid twice a year, and once paid, if additional money was available it would be used first to finance the current war and wars to come and second to pay off the loans. No one was allowed to revoke this statute.

Through the so-called *Ligatio pecuniae* the Venetian government formally revived an earlier practice concerning its indebtedness. The statute of 1262 granted lenders an annual interest of 5 percent on their capital, obliged tax revenues to the payment of regular interest, gathered into one series (a *Monte*) all the previous is-



sues, and eventually made loans almost irredeemable. The document can be considered both the proof of a long custom formally ratified and the start of true consolidated debt. The *Ligatio pecuniae*, thus, represents an important turning point in financial history.

The innovation led to further developments in financial markets: government credits were traded in a secondary market as financial assets, and financial derivatives—such as overdue interest—became diffused objects of trade. Furthermore, state bonds took on a more important role in both private portfolios and social institutions. This chapter shows the rise of the *Monti* system and its importance for some Italian cities from the late Middle Ages through the early modern period. The system of deficit financing that oc-

Decree of Venice government. March 12, 1262. Decree of the Venetian government which guarantees a regular interest of 5 percent to lenders.

curred in these cities marks the beginning of modern state finance and the development of a sophisticated credit market based on government loans.

Funding the Debt

Starting from the eleventh century in central and northern Italy, cities began to grow as both political and economic centers. They freed themselves from imperial tutelage and some expanded their area of control well beyond the urban walls. During the thirteenth and fourteenth centuries major cities such as Florence, Genoa, Milan, and Venice were able to extend their territorial control; those of Venice and Genoa attained the importance of maritime empires. The formation of a territorial state came at enormous costs. How did urban governments raise the money needed to cover such expenses? Since increasing or raising new taxes required time and, above all, public acceptance, the easiest way was to borrow from the wealthiest citizens. The early reports about this practice date from the twelfth century, when some communes gave goods or revenues as guarantees to people who had lent money. Thus, for example, in 1152 Genoa applied to some foreign lenders who, in exchange for 50 lire, were given the proceeds of the customs at Rivarolo for two years (at about 40 per cent of annual interest).[2] In 1164 the Venetian government granted eleven years of income from the Rialto market to a dozen wealthy citizens who had lent 1,150 silver marks (about 270 kilos of silver).[3] Governments, however, regarded indebtedness as a temporary solution: it allowed them to face urgent needs but had to be eliminated quickly. Governments mostly called for short-term loans at high interest rates, which were very seldom made public in order to escape the censure against usury. Lenders were prominent citizens identified through informal contacts, and thus this system involved a select group of people. Rising costs, due above all to war, compelled governments to resort more frequently to indebtedness, until it became a common practice in the financial policy of some cities of central-northern Italy.

Along with voluntary loans, some communes began to require forced loans from well-to-do citizens. As far as we know, the first Italian government to do so was that of Venice, which in 1171, in order to prepare a fleet against the Byzantine emperor, decreed a loan from every citizen in relation to his patrimony, at an interest rate of 5 percent until the money was paid back (*donec pecunia imprestata restituatur*).[4] During the last quarter of the thirteenth century the demand for loans on Venetian citizens grew: they had to deposit a part of their assessed wealth into state coffers, the sums were registered on public books, and tax revenues were devoted to paying interest. By 1274 Genoa adopted a similar measure, and some loans were consolidated and managed by a single state agency. The republics of Venice and Genoa were thus the first to transform their floating debt into a consolidated debt; later, some Tuscan communes would follow suit. The main features of such a system were extraordinary financing through irredeemable forced loans; moderate interest rates; credits that were heritable, negotiable, and usable payment; an amount consolidated and managed by a specific authority; and specific tax revenues designated for paying interest.

This model presents some variables. The concept of an irredeemable loan emerged only toward the end of the fourteenth century, when urban governments faced difficulties repaying borrowed capital. The negotiability of the bonds was not always allowed, at least in some cities; the early debt was managed by various offices, as was typical at the time. One can assent, however, that the thirteenth and fourteenth centuries witnessed a new way of creating debt—a way that allowed the collection of huge sums to support the growth of powerful territorial states.

A Tale of Three Debts

This section deals with the funded debts of Venice, Florence, and Genoa[5]: it presents the institutional framework within which the debts were incurred and puts some considerations in comparative perspective.

VENICE

Venice anticipated forms of long-term indebtedness that later spread to major urban centers of central-northern Italy.[6] Until the 1370s the debt grew in times of war but declined in times of peace, as soon as loans were retired by the *Camera degli imprestiti* (loans office), the agency dealing with forced loans. The third war against Genoa (1378–81) provoked the first severe financial crisis of the state. The payment of interest, until then regular, was suspended, the requests for compulsory loans increased, and bond prices on the open market collapsed. The extreme fiscal pressure particularly affected the lower-class citizens. Because loans were requested only from Venetians whose patrimonies were assessed by the fisc, those who were not registered in the tax books (the so-called *estimo*) avoided the obligation of lending and, at the same time, were able to purchase greatly depreciated bonds on the open market. Accordingly, the situation proved favorable to speculators, who could buy bonds at low prices and thus effectively enjoy a higher interest rate. The crisis of the late fourteenth century began a long period of decline of the Venetian *Monte*: the almost endless wars both in Italy and against the Turks gave no rest to state finance, and the interest on government credits dropped. Furthermore, payments to bondholders were more and more sporadic. By 1463 the government decreed a direct tax (the *decima*) on a semiannual basis. The crisis of forced loans had led to direct taxation as a means to finance state spending. A mixed system thus developed, consisting of both forced interest-bearing loans and direct taxes.

During the war against Ferrara, the government tried to lower its debt by issuing a new series of bonds in 1482. The new series, known as *Monte Nuovo*, initially had initial success and the value of these credits on the secondary market remained quite high, while the bonds of the *Monte Vecchio* were almost worthless. However, due to the continuous military engagements of the Republic, the *Monte Nuovo* bonds also collapsed. At this point, the government began selling credits at less than par value so as to offer an effective interest rate higher than normal. Bonds were offered at attractive prices (from 90 percent to as low as 48 percent of par), so many Venetians rushed to buy them. New series were issued in 1509 (*Monte Nuovissimo*) and 1526 (*Monte del Sussidio*), but the forced loan mechanism no longer raised money efficiently. The market value of new government credits soon dropped and the continuous requests for loans to Venetians caused severe tension in the city. Financial authorities complained that the money collected through the *Monti* was scarcer and scarcer.

The open capital market developed in response to the unmanageable crisis of the *Monti*. In the 1520s the Venetian mint issued loans to be underwritten voluntarily: at first the interest rate was rather attractive and the term for paying back capital quite short. In the 1530s the new system took hold: the Mint issued voluntary loans, which enjoyed success. These new loans—called *Depositi in Zecca*—had many advantages: unlike the *Monti* credits, the Zecca bonds were tax-free and offered a higher return. By 1538, along with irredeemable bonds, the government sold life annuities, which were particularly appreciated by investors. Their high interest rate (14 percent) attracted many lenders, but during the second half of the sixteenth century the government resorted to

such loans sporadically. In the following century life annuities were issued frequently; beyond Venice, they also attracted Genoese investors who were looking for safe funds after their Spanish adventures. Venice and Rome became protected harbors for Genoese money. The *Depositi*, both redeemable and lifeterm, represented the pillar of Venetian public debt. After the storm of the Italian Wars (1494–1530), careful debt management reassured investors. Venetian finances were so healthy that between 1579 and the early seventeenth century the whole state debt (*Monti* and *Depositi in Zecca*) was eliminated. The government repaid borrowed money and, at least until the war of Gradisca (1615–17), did not call for further loans. The amortization of debt provided further proof of the Republic of St. Mark as a sound debtor.

FLORENCE

Florentine debt had similar components but a different outcome. After the consolidation in the 1340s, the size of loans to the *Monte Comune* grew in order to support the political expansion of the city on the Arno. There is some evidence that indebtedness was greater in Florence than in Venice. The interest paid before a reform in 1345 was around 10 percent, and, although the reform set interest at 5 percent, the government often exceeded this ceiling. Both to attract investors and to avoid censure against usury, on some occasions (in 1358, 1362, and 1369) the Florentine government, like the Venetian and Genoese governments, granted a nominal credit on the *Monte* books higher than the amount that had been effectively paid.[7] The effective interest rate thus proved to be 10 or 15 percent. These credits, which benefited wealthy citizens, were among the causes of the popular anger which broke out in 1378 during the revolt of the *Ciompi* (wool carders).[8] Rebels accused lenders of getting an excessive return from the *Monte* and tried to cut down, at least partially, the burden of debt, starting from the most onerous loans. The riot lasted a few weeks, but soon the oligarchs resumed power.

During the first quarter of the fifteenth century the debt grew dramatically. During the 1390s Florentines were required to loan 271,307 ducats a year; between 1424 and 1432 the annual average was 549,637 ducats.[9] The forced loans (*prestanze*) represented the fastest and most effective way to finance war. Some data on Venetian finance in 1426–1427 show that this system provided capital equal to half of the state income; in Florence, during the first thirty years of the fifteenth century the average proceeds of the *prestanze* corresponded to the annual income.[10] No doubt the financial capacity of Florence was remarkable; in the 1420s and 1430s the financial pressure on citizens probably reached the highest levels in Florentine history. As in Venice, however, the increasing debt made it difficult to pay the interest to the creditors, reducing the wealth of the bondholder.

One response to the financial crisis of the early fifteenth century was the institution of the *Monte delle doti* (dowries fund).[11] The *Monte delle doti* had been founded both to meet the financial needs of the government and to offer Florentines a chance to place money in a suitable fund that would be useful to their daughters at the age of marriage. Florentines deposited in the *Monte* an amount that, at the time of marriage, would be paid back with interest. When this *Monte* was founded in 1425, it did not have great success; the financial condition of the commune was troubled and potential investors were worried about the safety of their funds. After some reforms, however, many citizens invested in the dowries *Monte*. The interest rate promised at the moment of the refund of the capital reached a 17.4 percent compound interest rate; furthermore, since deposits were partly underwritten with *Monte Comune* bonds, the Dowries *Monte* allowed the decrease of the government debt. However, the financial difficulties of the *Monte Comune* also affected

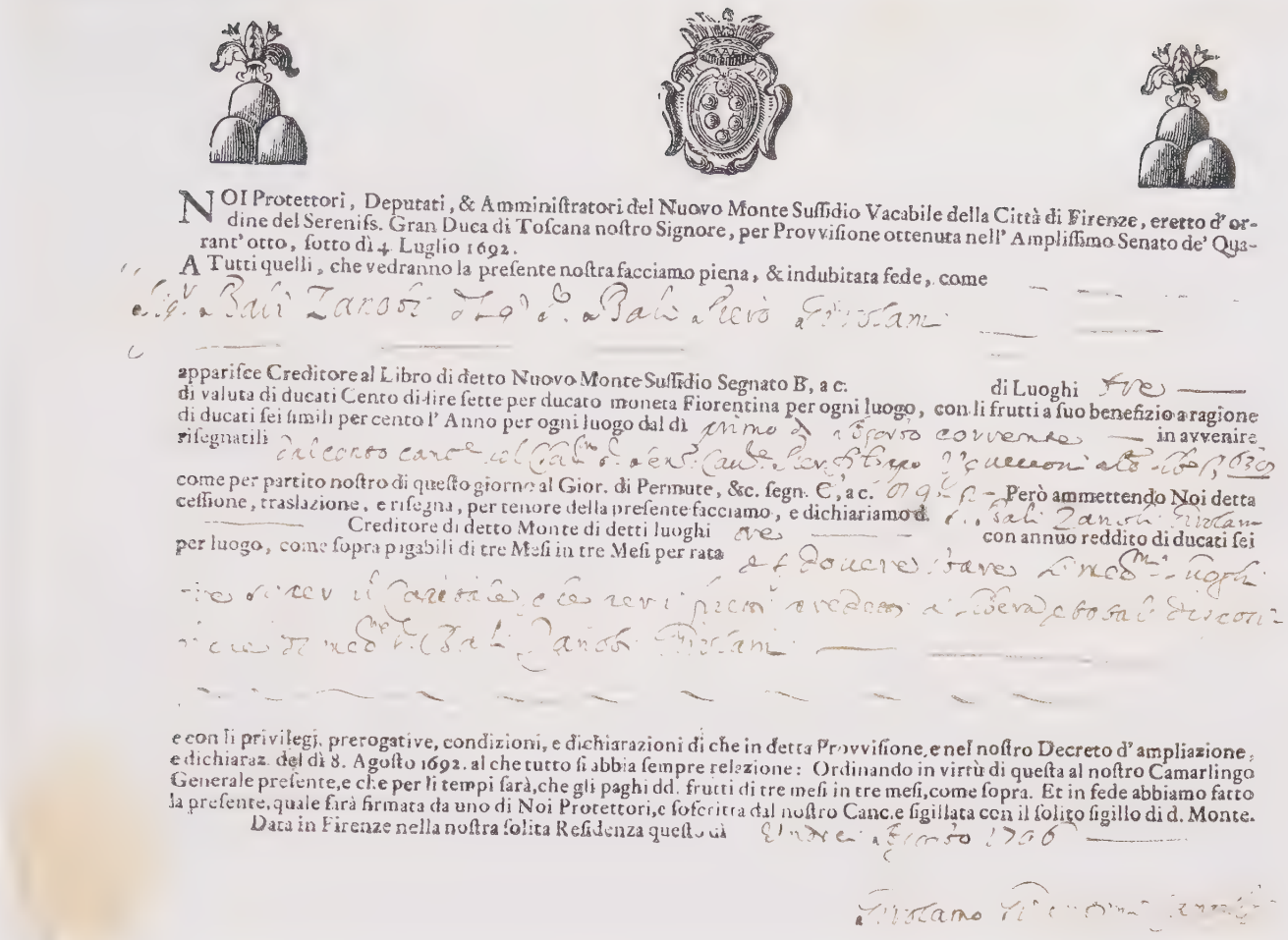
NOI Offiziali del Monte di Pietà della Città di Firenze, Protettori, & Amministratori del Monte non vacabile eretto d'ordine del S. G. D. di Toscana nostro Sig. per la Prouisione publicata nell'Ampliſſimo Senato de' 48. il dì 23. di Aprile 1616. cediamo, & assegniamo à [illegible] Luoghi [illegible] di detto Monte di valuta di scudi cento per ogni luogo di lire sette per scudo moneta Fiorentina con i frutti a ragione di scudi cinque l'anno simili per ogni luogo da hoggi in auuenire. Il prezzo de' quali luoghi di detto Monte ci è stato pagato di contanti in mano al nostro Camarlingo generale in scudi [illegible] come à Entrata D a [illegible] E noi l'habbiamo fatto descriuere creditore, e padrone de sudetti luoghi al libro di detto Monte eretto per detta Prouisione segnato D de' Liberi à [illegible] per pagarli i frutti di sei mesi in sei mesi la rata porzione, e con i priuilegij, condizioni, e dichiarazioni di che in detta Prouisione, e non altrimenti, nè in altro modo. Et in virtù della presente ordiniamo al Camarlingo generale del nostro Monte, che per i tempi sarà, che paghi detti frutti di sei mesi in sei mesi, & in fede habbiamo fatta fare la presente, quale sarà sottoscritta da vno de' nostri Offiziali, e dal nostro Proueditore, e Cancelliere, e sigillata con il solito sigillo di detto Monte. Data in Firenze nell'Offizio di detto Monte di Pietà il [illegible]

Above: *Monte di Pietà bond. 1627. Monte de Pietà* were founded in a number of European cities as Christian charities and lending societies. In 1624, the *Monte de Pietà* in Florence began to issue interest-bearing bonds. This *Monte de Pietà* bond was issued in 1627, and it promised to pay the buyer an interest rate of 4.5 percent per year. The decoration shows the figure of Christ dispersing loaves of bread—a symbol of the original, charitable purpose of the organization. The central symbol is the crest of the Medici family, the longtime rulers of Florence in the Renaissance era, leaving little doubt regarding the guarantors of the loan. In the first line of the bond is the term "non vacabile" which indicates that the interest payments were not limited in term to the life of the bondholder and could be transferred. *Monte de Pietà* banks have continued to operate in Italy to the present day.

Opposite: *Florentine Life Annuity. 1706.* Government bonds were widely used by Florentine citizens as savings instruments and wedding dowries. This instrument allowed the subscriber to receive an interest of 6 percent until his death.

the dowries *Monte*, so that by the end of the fifteenth century the deposits for dowries notably decreased. The dowries *Monte* represents an interesting financial institution, since it provided a tool of social security to Florentines. Although most *Monte* investors belonged to the Florentine upper class, one cannot deny that the dowries *Monte* raised money from artisans and workers as well. Like the well-to-do, common Florentines were concerned about providing their daughters with "honorable" dowries, and the *Monte* allowed them to achieve this task.

Unlike in Venice, the crisis of forced loans in Florence did not initiate a clear move toward the open capital market. In the sixteenth century the Florentines continued to pay *prestanze*, though to a lesser extent than in the past.[12] Furthermore, from the middle of the fifteenth century the Medici government had relied more and more on short-term loans.



NOI Protettori, Deputati, & Amministratori del Nuovo Monte Sussidio Vacabile della Città di Firenze, eretto d' ordine del Serenis. Gran Duca di Toscana nostro Signore, per Provvisione ottenuta nell' Amplissimo Senato de' Quarant'otto, sotto dì 4. Luglio 1692.

A Tutti quelli, che vedranno la presente nostra facciamo piena, & indubitata fede, come

apparisce Creditore al Libro di detto Nuovo Monte Sussidio Segnato B, a c. di Luoghi
di valuta di ducati Cento di lire sette per ducato moneta Fiorentina per ogni luogo, con li frutti a suo benefizio a ragione
di ducati sei simili per cento l' Anno per ogni luogo dal dì in avvenire
sisegnatili
come per partito nostro di questo giorno al Gior. di Permute, &c. segn. C, a c. – Però ammettendo Noi detta
cessione, traslazione, e risegna, per tenore della presente facciamo, e dichiariamo d.
Creditore di detto Monte di detti luoghi
con annuo reddito di ducati sei
per luogo, come sopra pagabili di tre Mesi in tre Mesi per rata

e con li privilegi, prerogative, condizioni, e dichiarazioni di che in detta Provvisione, e nel nostro Decreto d' ampliazione, e dichiaraz. del dì 8. Agosto 1692. al che tutto si abbia sempre relazione: Ordinando in virtù di questa al nostro Camarlingo Generale presente, e che per li tempi sarà, che gli paghi dd. frutti di tre mesi in tre mesi, come sopra. Et in fede abbiamo fatto la presente, quale sarà firmata da uno di Noi Protettori, e sofcritta dal nostro Canc.e sigillata con il solito sigillo di d. Monte.
Data in Firenze nella nostra solita Residenza questo dì

These allowed the Medici to strengthen their patronage network but, at the same time, made the cost of indebtedness more onerous. During the war against Siena (1555), the grand duke Cosimo I exploited short-term loans provided by foreign bankers. During the sixteenth century, therefore, deficit financing of the Florentine state still seemed to rely on the past practice. Between the end of the sixteenth and the beginning of the seventeenth century, however, the Tuscan government turned to the open market for bonds by raising loans primarily through the *Monte di Pietà* and the issuance of life annuities. Initially funded in 1496 as a charitable institution for providing the poor with small loans against pawns, the *Monte di Pietà* later became a deposit bank and a powerful financial device for the dukes willing to draw liquid capital both for themselves and their friends.[13] The government, furthermore, resorted to the open market by issuing bonds guaranteed on some tax proceeds, such as the salt tax, and on the funds of the *Monte di Pietà*.

GENOA

In the second half of the thirteenth century, as we have seen, Genoa followed Venice in the consolidation of her debt.[14] It was, however, not until the middle of the sixteenth century that the authorities officially admitted they were unable to redeem the principal. This was simply a formality, since the Genoese had long considered their loans to the

government irredeemable. Until the early fifteenth century, each loan (*compera*) series had a life of its own; every reform that unified the previous loans was soon followed by additional issues. The interest rate paid by the government was quite high, floating between 8 and 10 percent. In 1407, the government decided to gather all the loans in a single fund to be managed by the *Casa di S. Giorgio* (House of St. George). The *Casa* became a powerful financial institution; it was a broad consortium of lenders to the commune and it acquired ever greater control over revenues of the state, using them both as guarantees for the loans and as payment of interest. The *Casa* even obtained jurisdiction over some colonies of the Republic—for example, the island of Corsica—and used ambassadors and soldiers as well. The power of the *Casa di S. Giorgio* impressed contemporaries so much that Machiavelli famously described the financial institution as the core of the Genoese state: "citizens transferred their affection from the commune as a tyrant thing, to *S. Giorgio* as a part well and equally managed."[15] The Florentine secretary acutely observed that the Genoese were not very worried about political instability so long as it did not affect the *Casa*. Actually, the role played by the *Casa* in Genoese economic life can be considered crucial: most tax revenues were directly managed by the *Casa*, and the *Casa* was able to provide the government with huge loans. But it would be wrong to see *S. Giorgio* as extraneous to the political system of Genoa; on the contrary, the *Casa* can be regarded as a pillar of the system, assuring a wide redistribution of financial resources among the citizens.

Starting from the fourteenth century, the Genoese government turned over to groups of lenders the management of some taxes. So the later reform of the *Casa di S. Giorgio* stemmed directly from earlier experience. Even so, the consolidation of all the *S. Giorgio* loans in the early fifteenth century was, both for the amount of the capital and the managerial efficiency, a fundamental step in Genoese history. The activity of the *Casa* expanded along with the state debt, and, accordingly, the range of citizens tied to the institution widened. The role of the *Casa* continued until the end of the Republic (1797), when the French army ended the existence of both a small state and a big financial institution.

COMPARISONS

Now that the debts of Venice, Florence, and Genoa have been introduced, the similarities and differences of these three cities may be highlighted. Institutionally, Venice and Florence differed sharply from Genoa. In Venice and Florence the debt was administered by a government agency (the *Camera degli imprestiti* in Venice, the *Monte* in Florence), while in Genoa the debt was managed by a semiprivate consortium that represented the interests of the creditors of the state and mediated between the citizens and the government. The Casa provided shares (*luoghi*) upon request of the commune and managed the tax revenues assigned to lenders for the payment of interests. Genoa, and later Florence, relied heavily on intermediary institutions that raised loans for the government; Venice, on the other hand, chose the open market and succeeded in building a direct relation with her own citizens. While both Venice and Florence used the *estimo* (property register) to distribute loans in Genoa, the wealth registers were of little importance. Furthermore, obligatory loans prevailed more in Venice and Florence than in Genoa.

It seems that the consolidation of the debt provoked little protest among the citizens; consolidation was probably decreed to reassure creditors about the solvency, in the long term, of the commune and to allow them to trade their credits. The recourse to consolidation represented a turning point, since the costs of indebtedness decreased and an important bond market emerged. Unfortunately, data on the rates paid by the governments

before consolidation are scarce, but the advantages for the treasuries seem to have been significant. For instance, in the first half of the fourteenth century the Florentine government had been paying interest rates between 8 and 15 percent, while after the 1340s reform the cost of loans, except during times of crisis, was set at 5 percent. Likewise, the interest on the Genoese loans, although higher than that on Florentine and Venetian loans, fell after the reform of 1407.

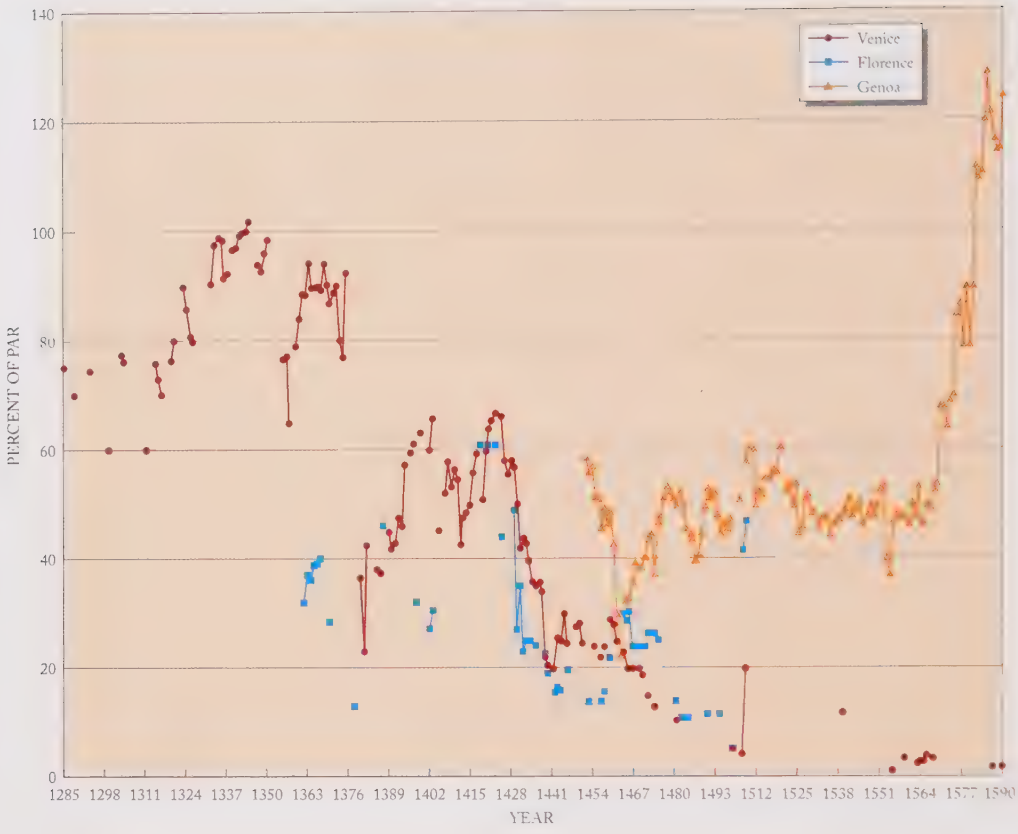
In the long run the results of the *Monti* system turned out differently. While the *prestanze* characterized the state borrowing of Florence up to the middle of the fifteenth century, the Medici government later chose to rely on floating debt. The Medicean system drew on a wide patronage network, which had to be maintained by granting favors. The return to short-term loans allowed a relatively narrow group of people to receive considerable income from lending to the government. The lenders took responsibility for raising the money necessary at a given interest (about 8 percent) and lent it to the commune at a higher rate (12 percent). This practice proved onerous for the government, but it strengthened the assets of the group tied to Medicean power.

The outcome of the Venetian financial crisis in the fifteenth century was very different: the failure of the new series of *Monti* led toward the development of the open market. Until the fifteenth century, the deficit financing mechanism was based on the *Monti*, but by the middle of the seventeenth century it was made up of a wide variety of voluntary loans, life annuities, lotteries, and, to a lesser extent, forced loans. The interest paid by the Venetian government decreased between the sixteenth and the seventeenth centuries, following a general trend, and it proved lower with respect to costs paid by several European governments. Furthermore, debt was not regarded as a mere tool of enrichment for the ruling class. Unlike in Florence, the role of the funded debt in Venice was never neglected, but the government lowered, as soon as possible, the return on the bonds, thus supporting public finance to the detriment of private interests.

Private interests in Genoa, on the other hand, seemed to prevail over those of the republic. The market prices of *S. Giorgio* credits show a different trend from those of the Venetian and Florentine *Monti*: from the middle of the fifteenth century the Genoese values seldom fell below 40 of par (see graph 8.1). This high evaluation of the Genoese bonds deserves some consideration. But first it is worth noting that the bonds of the Venetian and Florentine *Monti* witnessed a secular depreciation, due to both the decrease of the interest rate and the irregular payments to bondholders. The Venetian government, for instance, paid the interests on the *Monte Vecchio* for 1494 as late as 1556;[16] likewise, the Florentine creditors of the *Monte Comune* complained of huge delays in payments. *S. Giorgio*, instead, regularly supplied the money due to creditors. The changes in market values depended more on the uncertainty of the political climate than on the financial difficulties of the commune. The primary concern of the authorities of *S. Giorgio* was to satisfy the holders of the shares, and their purpose could be achieved thanks to an almost complete control of the state tax revenues. The return of the shares can be considered as a dividend, since it was mostly made from the distribution of the tax proceeds. If the tax yield was low, the governors of *S. Giorgio* would integrate the return assigned to the holders. The confidence the lenders felt toward the *Casa* was therefore justified. From the late sixteenth century the situation improved further, for the market prices of the shares never fell below par (see graph 8.2).

However, the success of the Genoese debt had an obvious negative implication for state finance. The assignment of fiscal income completely tied the hands of the republican government; the *Casa di S. Giorgio* was an institution whose sacredness and intangibility

GRAPH 8.1.
MARKET PRICES OF GOVERNMENT BONDS



could not be challenged. Genoese savers knew that Genoa's rulers could not threaten the system based on the *Casa* or they would risk a revolt. It was not by chance that the only proposal to close *S. Giorgio* came during an attempt to reform the power system in Genoa in 1575. If early modern Genoa represented a true paradise for savers, the republic of St. Mark carried out a policy, starting from the crisis of the late fifteenth century and early sixteenth century, that eventually affected the interests of lenders adversely. The decrease of the interest rate and the taxation on bonds reduced the return of the *Monte Vecchio* bonds. But the most important element that marks the differences of Venice and Florence from Genoa lies in the amortization of the state debt carried out by the Venetian government: the rulers chose to favor the interests of the state to the detriment of private interests. Florence, in its turn, unlike Genoa, did not abdicate in favor of the creditors, but chose the most expensive means of financing its deficit. One can argue that choice heavily influenced the Florentine financial system in the early modern age, while Venice was able to create forms of indebtedness that were new and very likely more effective.

The Market

The most important quantitative data that concern the market for government credits are prices and interest rates. First let us try to distinguish, if possible, nominal from real returns. Paradoxically, until the early sixteenth century, a primary bond market did not exist in Italian cities. The compulsory loans did not allow citizens any choice. There was, how-

GRAPH 8.2.
MARKET VALUE AND YIELD OF THE SHARES OF THE CASA DI S. GIORGIO

ever, a lively secondary market; unfortunately, we do not have much information on its structures. We know that specialists acted as brokers: in Genoa, for example, these intermediaries had desks to manage the purchase and sale of shares, and they fixed the prices as well. Government credits could be sold, used as collateral, or given as dowry. Since government bonds were not bearer bonds, every operation had to be registered at the state agency that managed the debt: a written or verbal order allowed the officer to transfer a sum from one holder to another. The objects of trade were not only the principal but also the interest claims, as well as the arrears the government owed its creditors.

Before analyzing aspects of the bond market, it is also useful to look at the profile of the shareholders. All the citizens registered in the tax lists were forced to buy bonds. Initially, only some inhabitants were called on to loan money, those with a designated minimum assessed property value (in Venice 50 lire from 1280 to 1325; 100 lire from 1325 to 1339; 300 lire from 1339 to 1446; 200 lire thereafter). Thus, in 1379, 12 percent of Venetian families had to lend to the government.[17] No doubt the required wealth level was quite high: one can argue that a property of 3,000 ducats could yield a minimum annual income of 150 ducats (c. 600 lire). This amount corresponded to the annual wage of three building assistants; therefore, it is plausible that many people were excluded from the system. In 1427 the Florentine families with analogous duties accounted for 14 percent of

the urban population.[18] Forced loans, therefore, were the business of a small portion of the population; the credits, however, were more widely dispersed through negotiation.

It seems that the first credits issued by the communes were not negotiable, but the possibility of trading them was recognized as soon as debts were consolidated. Venice anticipated Florence, where the negotiability of the bonds was allowed starting in 1344.[19] A complex capital market connected to the state loans emerged. The lack of bearer bonds does not seem to have constrained the trade of credits. The cost of the operation was quite low; besides the fees for the broker and the scribe, in some cases a tax was paid. In the early fifteenth century, the transaction cost in Venice did not exceed 0.5 percent.[20] In 1434 the Venetian senate decreed a tax of 2 percent on each purchase and sale of state credits, to limit speculative maneuvers. The Genoese government took 1 lira for each share negotiated.[21] Unfortunately there is not much data on the market; however, some hints suggest that government credits were the object of a lively trade. By 1365, almost one thousand inhabitants of the two Florentine districts of S. Giovanni and S. Maria Novella either held or had traded at least 100 nominal florins of the *Monte*.[22] This was a notable number of people, considering that the whole Florentine population did not exceed 30,000 inhabitants. In Genoa, the *S. Giorgio* share market looks quite important. In the second half of the fifteenth century the number of titles negotiated in a year corresponded to 4 or 5 percent of the principal held by *S. Giorgio*.[23] It has been estimated that by 1434 the turnover of Venetian credits corresponded to 100,000 ducats at market value or 300,000 ducats at par value.[24] The percentage, with respect to the whole debt, was around 3 percent. An analogous percentage emerges from research concerning the Florentine market in 1458, in which about 2 percent of the nominal debt was negotiated among private citizens.[25] We can therefore argue that every year as much as 5 percent of Italian credits were traded.

To loan to the commune was regarded as a duty, part of belonging to the urban community. Loans were connected, to a certain extent, with the concept of charity and gifts to the *res publica*. Some governments, as in Florence, at first forbade foreigners to hold state bonds, while it seems that in Venice since the thirteenth century foreigners were allowed to buy government credits. Some devices, nevertheless, were adopted in order to bypass such prohibitions; the easiest solution was to grant citizenship to those who were willing to buy government bonds. From the government standpoint, it was advantageous to support foreign demand: it elevated market values, so that those who had been compelled to sell credits obtained at par suffered less heavy losses. If during the fourteenth century the role of foreign investors was inconsistent, in the following century their presence was more visible. We know, for example, that in Genoa foreign merchants held credits of *S. Giorgio* that were used as guarantees for their business. Likewise, many foreigners purchased bonds on the Venetian market, counting on regular payment of interests. During times of urgent need, foreign investors were required to lend conspicuous amounts to governments.[26] At any rate, the foreign presence among bondholders seems to have been a limited phenomenon: by the early fifteenth century about one tenth of the Florentine debt was held by foreigners; in 1629, 92 percent of the principal of *S. Giorgio* belonged to Genoese citizens and institutions.[27] The small percentage of foreign investors suggests that the government credits market did not extend beyond the city walls. This means that the structure of the interregional credit market—at least central-northern cities—did not usually offer substantial opportunities to speculate on bonds. Throughout the fifteenth century the spread between interest rates was relatively small (see table 8.1). The decision to invest in foreign debt depended more on the creditworthiness of the government than on the return of its bonds. Unlike some Italian princely states, such as Milan and the

TABLE 8.1.
NOMINAL INTEREST RATE ON GOVERNMENT LOANS, 1250–1525

	Venice	Genoa	Florence
1251–1275	5	8	
1276–1300	5		10
1301–1325	5		8
1326–1350	5		12
1351–1375	5	10	5
1376–1400	4	8	5
1401–1425	4	7	3.75
1426–1450	4	4	3.37
1451–1475	4	3.5	3.25
1476–1500	5	2.8	2.5
1501–1525	5	4	

Venetian data include both the old series (*Monte Vecchio*) and the new (*Monti Nuovo*, *Nuovissimo*, and *Sussidio*).

From the late fifteenth to the early sixteenth centuries the *Monte Vecchio* bonds returned as low as 1.77 percent.

From the early fifteenth century the return of the Genoese shares was not fixed, as in Florence and Venice, but depended on tax proceeds.

Sources: R. Mueller, *The Venetian Money Market: Banks, Panics, and the Public Debt, 1200–1500* (Baltimore and London, 1997), 474–75; J. Day, *Les douanes des Gênes* 1376–1377 (Paris, 1963), xxv–xxvi, xxxi–xxxiii; C. Cuneo, *Memoria sopra l'antico debito pubblico, mutui, compere e banca di S. Giorgio in Genova* (Genova, 1842); D. Gioffré, *Il debito pubblico genovese. Inventario delle compere anteriori a S. Giorgio o non consolidate nel Banco,* sec. XIV–XIX (Genova, 1966); E. Conti, *L'imposta diretta a Firenze nel Quattrocento, 1427–1494* (Roma, 1984), 31 ff.; . B. Barbadoro, *Le finanze della Repubblica fiorentina. Imposta diretta e debito pubblico fino all'istituzione del Monte* (Firenze, 1929) 354 ff.

papal state, and German cities, the urban governments of Venice, Florence, and Genoa succeeded in raising enormous amounts of money from their citizens and very seldom borrowed from foreigners.

The number of state creditors was huge. By 1380 the bondholders of the *Monte Comune* of Florence were about 5,000;[28] that means that one Florentine in every six was a creditor of the government. Data of the famous *catasto* of 1427 show that 22 percent of Florentine households had *Monte* shares.[29] This ratio did not significantly change in the early sixteenth century, when bondholders (including those of the dowries fund) were more than 8,500 out of 50,000 inhabitants.[30] Genoa presents a similar situation. The accounts on the books of the *Casa di S. Giorgio* numbered more than 11,000 in 1460 and nearly 10,000 in 1502.[31] Considering that by 1500 Genoa had a population of 70,000, we can estimate that one citizen in seven enjoyed returns from the government debt.

If it is quite easy to determine which people were compelled to lend, the trade in the

TABLE 8.2.
GOVERNMENT DEBT AND WEALTH AT FLORENCE AND GENOA

	Florence 1427	Genoa c. 1650
	(Mill. florins)	(Mill. lire)
Funded debt	2.6	85.2
Interest	0.28	2.5
(Minimum) private wealth	12	282.5
(Minimum) annual income	1.5 (est)	11
	(florins)	(lire)
Private wealth per capita	274	3150
Income per capita	40 (est)	120
Interest per capita from government debt	7.5	27

The figure of the Florentine funded debt has been evaluated as half of its nominal value.

Florentine income is a personal estimate.

Sources: D. Herlihy and C. Klapisch-Zuber, *Les Toscanes et leurs familles. Une étude du catasto florentin*, (Paris, 1978); R.W. Goldsmith, *Premodern Financial Systems: A Historical Comparative Study* (Cambridge, 1987); G. Felloni, *Scritti di storia economica*, vol. 1 (Genova, 1999), 215, 230.

secondary market changes the profile of state creditors. By 1427, the number of Florentine households obliged to lend were fewer than those holding *Monte* credits. The distribution of credits, furthermore, shows a marked concentration among the wealthiest families: nearly 60 percent of bonds was held by only 2 percent of Florentines. This trend was probably supported by the decline of the market value of bonds. The case of the *gonfalone* Nicchio, in the quarter of Santo Spirito, is rather significant: from 1427 to 1458 the households holding government credits decreased from 157 (out of 458 assessed in the *catasto*) to 136 (out of 347) and, at the same time, there was an increasing concentration of shares among a few households.[32] Throughout the sixteenth and seventeenth centuries it seems that most of the bonds were in the hands of guilds and ecclesiastical and charitable institutions that looked to the state debt to assure a sound, even if relatively low, return.

The economic importance of the redistribution of money through the government debt can not be neglected. Table 8.2 shows some estimates; although these figures are unreliable, they may provide useful preliminary data. Both in Florence and Genoa, government creditors drew a significant share (about one-fifth) of their income from bonds. Accordingly, a flow of money spread through the city and revived the local economy.

The values of government credits were affected by political factors: peace and war determined the fluctuation of prices. Rumors of a possible war were enough to register an immediate reaction in the market, with a consequent loss of value in securities. Of course, the ups and downs of market values lent themselves to speculative operations, whose protagonists included rich people and also investment companies. During periods of major pressure, some lenders sold their credits to get cash to pay the new loans. This mechanism

concerned in particular citizens who did not have a great availability of cash. Obviously the state demand and the increase in the supply of credits on the open market decreased values, so that speculators could rake in credits at low prices and hope to take advantage of a later rise. It was a purely speculative operation, a sort of bet on the future capability of the government to fulfill its own commitments. But there were other reasons to sell or buy government credits: for example, the need to obtain cash for one's own business, and the desire to acquire capital to assure a safe income. It is thus no surprise that many citizens, in their last wills, urged their descendents to place money in funds of the government debt. The Genoese *compere* offered citizens an excellent opportunity to invest in an insurance fund. The *S. Giorgio* bondholders could exploit the mechanism called *moltiplico*, which allowed principal to increase through compound interest. Many funds were assigned for long periods of time to finance charitable institutions, to support families, to lessen the tax pressure on popular consumption, and even to decrease the debt of the republic of Genoa.

To analyze the yield of government bonds, it is first necessary to distinguish the nominal yield from the real one. If in the early phase of debt history the governments endeavored to ensure interest payments, rates later fell because of unilateral reductions, taxation, and delays in interest payments. In the secondary market, furthermore, the yield depended on the trend of values. When a government fixed the return of forced loans, it generally did not consider the prevailing interest rate on the market but it did take into account the question of usury. During the later Middle Ages, a lively debate occupied many people about the legitimacy of interest on government loans. The problem, in particular, concerned the speculation on the open market, rather than the interest rate on forced loans. A complex theoretical apparatus was built to morally justify profit from government loans. The Florentine politician and lawyer Lorenzo Ridolfi (1362–1442) was the most resolute advocate of the approach that justified speculating on the debt market. Other theorists condemned such a practice as illicit and advised investment in trade—which was considered safer—through licit contracts. The state authorities maintained commonly accepted nominal rates, with few exceptions. Venice and Florence offered prevailing interest rates of 5 percent, while the Genoese creditors, until the middle of the fifteenth century, could count on higher yields. An accepted interest rate ranged from 5 to 15 percent, as in Florence in the second half of the fourteenth century.[33]

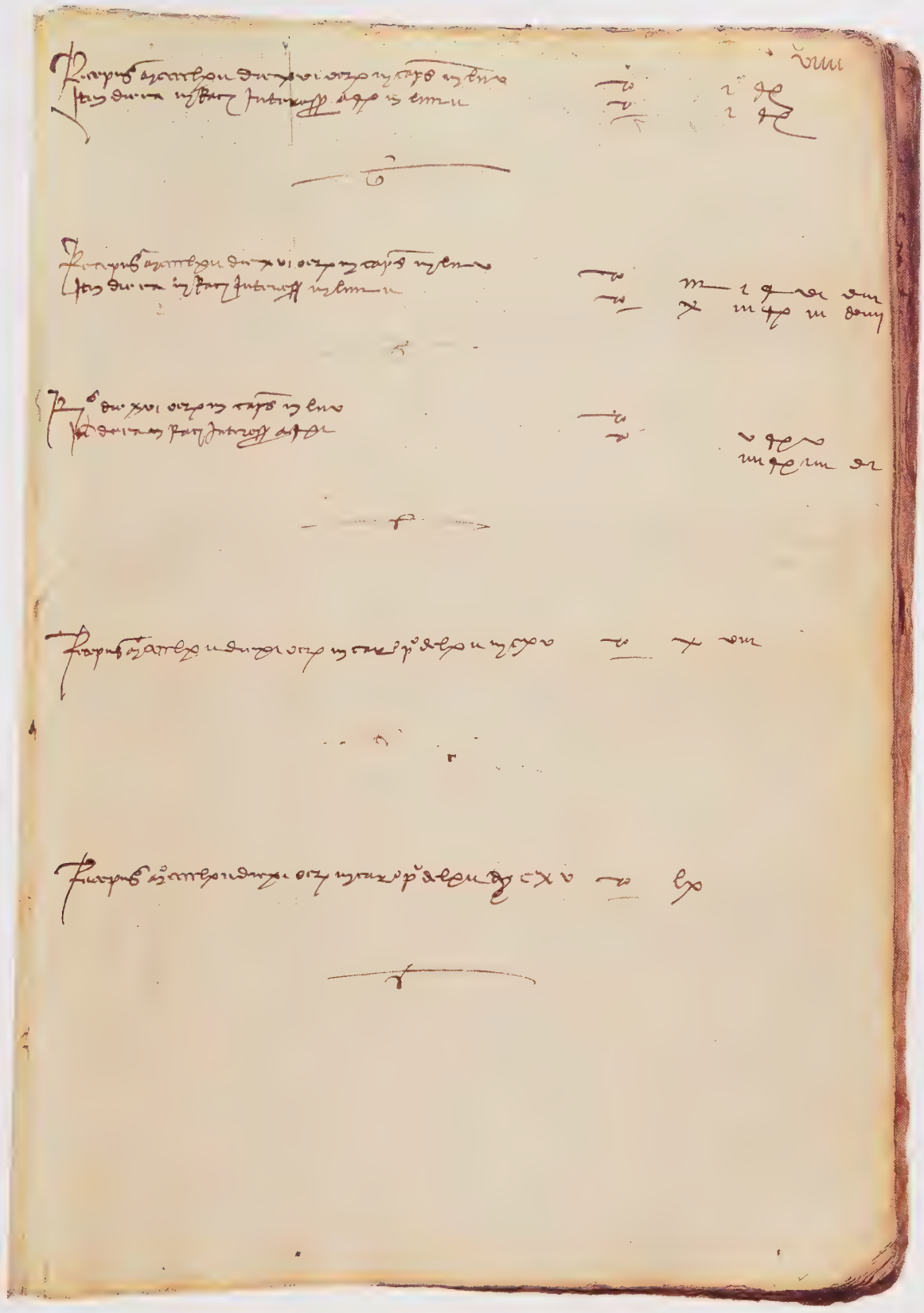
What was the meaning of a return of 5 percent during the Renaissance period? The attractiveness of a given yield depended on the economic context and on the expectations of investors. The private credit market showed higher interest rates than those provided by the government credits: in the first half of the fourteenth century the Florentine bank of Cambini lent to private individuals at 8 to 14 percent, while it obtained 14 or 15 percent from voluntary loans to the government. By the middle of the century, Piero Guicciardini's debtors paid between 11 and 16 percent. In the fifteenth century, long-term deposits in Florentine companies yielded between 7 and 10 percent,[34] when the credits of the *Monte Comune* gave a return of about 3 percent. The considerable profits of the Cambini bank from credit activity in the fifteenth century attained in some cases over 60 percent, while in 1478–84 the Strozzi bank in Naples averaged profits of 18 percent.[35] As far as is known, risk-free loans (guaranteed by real property) between the late thirteenth and the fifteenth centuries yielded 10 to 12 percent.[36] Government credits, therefore, were not particularly remunerative if one considers the alternatives as offered by long-term private credits.

As for commercial returns, the comparison with state loans turns out to be quite ardu-

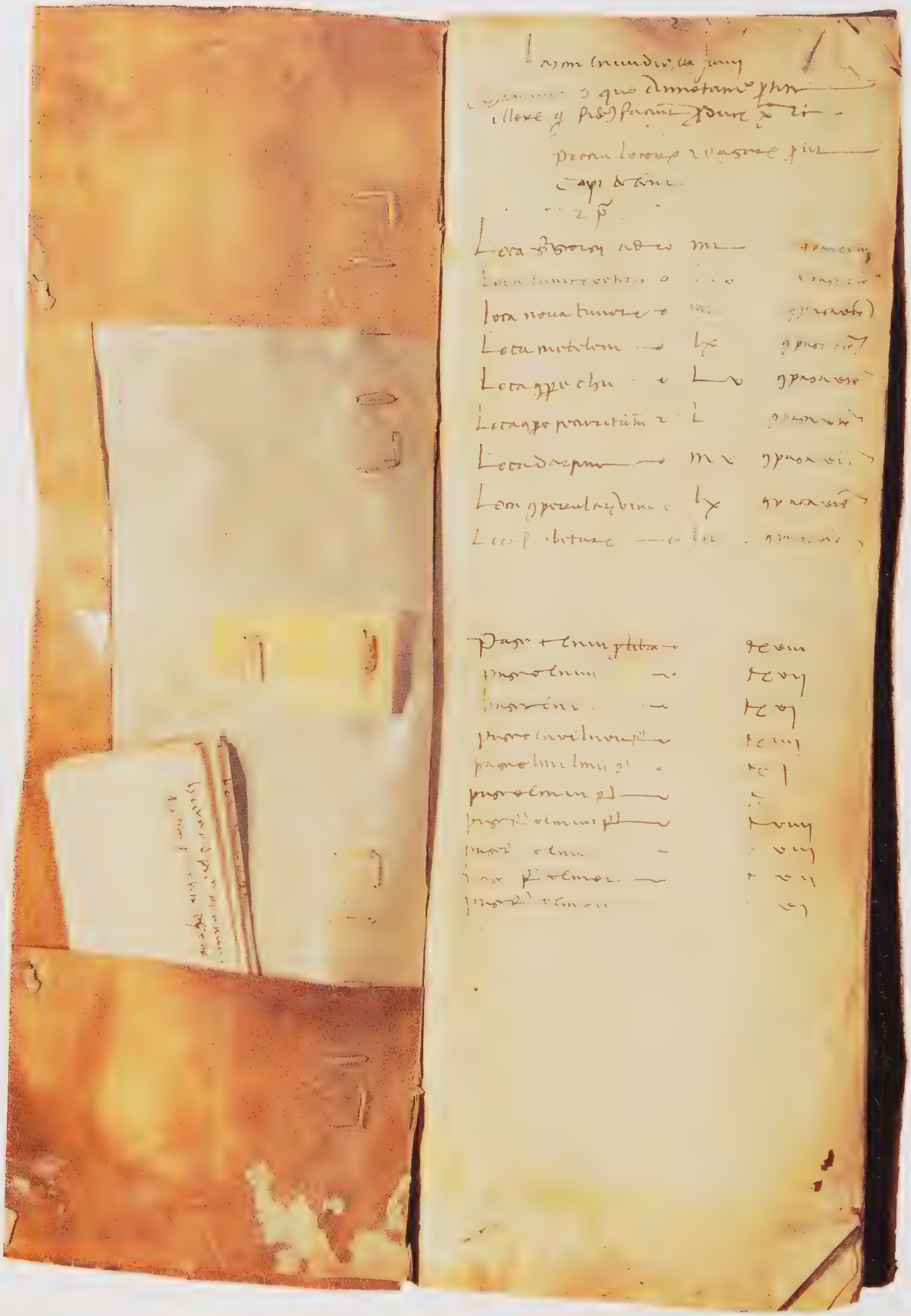
ous, since the yields depend heavily on business conditions. It has been estimated that trade with the Near East during the fifteenth century returned as much as 35 to 50 percent on investment.[37] It is likely, however, that a merchant, as the Venetian Andrea Barbarigo stated, could expect an easy return of over 12 percent.[38] The great competitor to state financial income, therefore, seems to be land income, generally yielding no more than 5 percent. However, those who had bought bonds on the secondary market below par could enjoy higher yields. Had the government regularly paid the interest promised, the yield exceeded 7 percent and could reach 10 percent. Under these circumstances state debt was an attractive investment, but speculation does not seem to have dominated the market. No doubt there were specialists in the sector, but most negotiations involved common people as lenders, and charitable and religious institutions as buyers. The great Genoese bankers, for instance, do not seem to focus their concern on the *S. Giorgio* bonds, being more engaged in the broader international market. The primary motivation to buy government bonds was a desire for safe income comparable to that provided by land.

An interesting aspect of the bond market concerns the negotiability of interest (*paghe* at Genoa and Florence, *prò* at Venice). Usually, interest had to be paid in installments (two times a year in Venice, three times in Florence, and four times in Genoa). When governments proved unable to pay interest regularly, a speculative market arose based on overdue interest to be paid in the future. Operators tried to determine the future trend of prices, and discounted payments prevailed, along with options on credits to be bought for a set price at a future date. Unfortunately, evidence from Venice and Florence is scarce,[39] although the archives of Genoa contain many records of such transactions. Starting from 1456, annual interest on Genoese shares was delayed, first for three years, and later for five years. Since the amount of the overdue interest was registered on the books of the *Casa di S. Giorgio*, these credits soon became money to be used in the usual transactions. Upon written or verbal order, the operations in lire *di paghe* ("of pays") were made through giro from one account to another. A discount was applied according to the date when the payment came to maturity. Claims upon lire *di paghe* thus were used as short- and medium-term loans, the discount rate being the difference between the price of a *paga* at a given time and the nominal value.[40] It has been estimated that about 10,000 giro operations were made annually in the second half of the fifteenth century.[41] No doubt it was a huge amount of activity, considering that similar transactions in Venice, which concerned interests on the *Depositi in Zecca* between 1647 and 1671, averaged 200 a year.[42]

Public debt is considered to be a powerful tool of wealth redistribution, since the resources for payment of interest came from taxation. A greater burden of interest brought about a heavier taxation; therefore, the debt was at the center of a money flow from taxpayers to government creditors. Accordingly, the choice of resources to be devoted to payment of interest was not neutral. Most of the money used to pay interest came from taxes on trade and on consumption: in 1382 taxes on trade and business provided 58 percent, and taxes on consumption 32 percent of the resources for paying interest on the Genoese *compere*; toward the end of the fifteenth century, in Venice almost half of the interest payments came from taxes on consumption.[43] Likewise, Florentines clearly felt that the lower classes paid creditors through the taxes on consumption. However, this model requires some qualification. For instance, during the early phase of her indebtedness, Venice was able to unload the burden on foreign consumers through the imposition of duties on exports and, subsequently, on taxpayers, of her possession in Italy. In Genoa, on the other hand, the situation worsened during the fifteenth and sixteenth centuries, when the fiscal pressure on consumption increased considerably just to pay the debt at the *Casa di S.*



Casa di S. Giorgio, provisional no. 150. This account records a speculative transaction on interest claims (paghe) of shares (loca) of the House of St. George. The nominal value of the claim is registered on the right. On the left is the purchase price.



Compere e mutui, reg. 1913. June 3, 1474. The document shows the value of some shares of the *Casa di S. Giorgio* (top) and the discounted price of interest claims (paghe) to be paid in the future (bottom). Thus, the paga of 1475 is evaluated at 16 soldi (80 percent of the nominal price), 14 soldi (70 percent) that of 1476, 6 soldi (30 percent) that of 1487.

Giorgio. Between 1450 and 1650 income from taxation on consumption grew by fifteen times, whereas other fiscal items increased by five or ten.[44]

Conclusion

It would be inaccurate to regard public debt as a tool of pure pressure on lower classes. The function of government debt is manifold. First, the enormous concentration of capital in some Italian cities allowed governments to transform, through public credit, private wealth into military power, to build a territorial state, and to control a wider economic area. This process reduced protection costs for domestic markets and increased economic and financial resources to the capital city. The cost of credit was, in economic terms, quite moderate. Italian governments collected money from taxpayers at 5 to 7 percent, whereas the major European monarchies of the Renaissance were compelled to borrow at a much higher price. Second, the debt also took on a political function. To be creditors to the government meant sharing the destiny of the regime and, consequently, supporting it. In Florence, the Medicean regime tied to itself an oligarchy that profited from the management of the government debt. Thus, the debt helped create stability. Third, the social structure was supported by state debt: the considerable bond income drawn by charitable and social institutions and redistributed to the poor maintained a paternalistic policy that was a pillar of the urban political and social system. Fourth, both government bonds and interest provided an effective surrogate of cash money in the later Middle Ages during a period of bullion shortage.[45] The trade of bonds and interest claims opened up sophisticated forms of speculation and implemented financial techniques that are quite familiar to modern brokers. Finally, the means devised by the governments to finance the deficit offered new forms of social security and investment (dowries, life annuities, lotteries) that are at the roots of later financial system.

9

Venture Shares of the Dutch East India Company

LARRY NEAL

The origin of modern stock exchanges that specialize in creating and sustaining secondary markets in corporate securities goes back to the formation of the Dutch East India Company in the year 1602. In March of that year, the States General of the United Provinces of the Netherlands adopted a charter that created the Verenigde Nederlandsche Geoctroyeerde Oostindische Compagnie (United Netherlands Chartered East India Company, thereafter referred to as the VOC). There can be no doubt this was a political decision designed to aid the finances of the Netherlands in the midst of what turned out to the Eighty Years War against Spain, an ongoing military and naval effort that spawned many other financial innovations as well over the period of that conflict, 1572–1648. By 1688, when the Dutch joined forces with the English under the leadership of William III, Prince of Orange, there was an active, sophisticated trade in the shares of the VOC carried on within the precincts of the Amsterdam Exchange by a specialized group of brokers, dealers, and speculators. Joseph Penso de la Vega, one of the Sephardic Jewish elite of Amsterdam that were to be so useful to William of Orange in helping to finance his ever more expensive military campaigns, described eloquently in *Confusion de confusiones* the operations of the Amsterdam stock exchange in 1688.[1] Penso de la Vega's motivation for his work, dedicated to Duarte Nuñez da Costa, was to put a

literary and philosophical gloss on the scorned activities of the *accionistas* speculating on the Amsterdam stock exchange. Quickly translated into English and excerpted extensively in John Houghton's *A Collection for the Improvement of Husbandry and Trade, Confusion de confusiones* certainly helped the advisors to William III mobilize capital in London to finance his campaigns against Louis XIV. Penso de la Vega noted that even by the end of the seventeenth century, the dominant business on the Amsterdam stock exchange was trading in shares of the VOC.

This dominance is all the more remarkable as the total capital of the VOC remained then, and on to its eventual demise in 1795, fixed at the sum of 6,440,220 florins, a slight increase from the original sum of 6,424,588 florins pledged in the subscriptions entered by August 31, 1602. How was it possible to base the activity of the capital market for the richest merchant community in Europe on a financial asset available in such limited amount; and, more important for understanding the sources of successful financial innovations, how did such an active trade in a limited quantity of financial capital arise in the first place? The initial impulse for the VOC, as for so many financial innovations throughout history, came from the exigencies of war finance. But the success of permanent, but transferable, share capital in the VOC depended upon a favorable economic, political, and legal environment that had arisen in previous decades within the Netherlands. Before examining the essential features of the Dutch environment, however, it is important to appreciate the initial impulse for this financial innovation of permanent shares in a joint-stock, long-distance trading company—the exigencies of war finance.

The military pressures faced by the political leaders of the United Provinces since their original revolt against the fiscal demands of Philip II of Spain in 1572 had nearly overwhelmed the Dutch forces until the Spanish armada collapsed in 1588. After 1590, both the Stadholder of Holland, Maurice of Nassau, and the advocate general of the States General, Johan Oldebarnevelt, had enjoyed increasing success in their ongoing efforts to organize the fractious provinces, with their competing merchant groups, into a coherent political force capable of raising, and sustaining, a standing army and extensive fortifications. According to Jonathan Israel,[2] much of their success was due to the habits of communal efforts that had developed in the states of Holland and Zeeland from the Middle Ages to organize first the creation of polders, then the maintenance of dikes and canals, then the cooperation in larger scale bulk trades in salt, herring, wheat, and wine. Given the small scale of individual merchants in the Netherlands, capital in these small to medium-sized ships was divided into much smaller shares than was the case in richer cities such as Venice, Genoa, or Antwerp, frequently going as small as one sixty-fourth of the ship and of its cargo. In addition to habits of communal cooperation in joint ventures, both on land and on sea, however, the number of possible seaports was numerous enough that intense competition arose among western province cities with access to the sea.

The defeat of the Spanish Armada sent against England in 1588 by Philip II, and Philip's subsequent focus on maintaining military pressure against France while neglecting the overseas trade of the Portuguese *Estado da India*, provided Dutch adventurers with opportunities to encroach upon the long-distance trade of Portugal with both the West and East Indies. No fewer than sixty-six separate ships had left the various ports of the Netherlands in attempts to reach the sources of pepper and spices in the East Indies.[3] Some tried the Northwest Passage through the Arctic Circle in Canada, some the northeast passage through the Arctic Circle in Russia, some the westward voyage through the Straits of Magellan and the South Seas, but only those that used the Cape of Good Hope route around Africa managed to return with profitable cargoes. (And most of the ships

using alternative routes failed to return at all.) Enough of those ventures, however, were so profitable that the investors willingly put up their capital again for subsequent voyages and more merchant communities entered the competition. It was at this point that Prince Maurice and Oldebarnevelt intervened to create an encompassing company that would centralize the direction of the Dutch efforts to open trade with the East Indies, while encouraging the competitive mobilization of the resources necessary.

The charter of 1602 built on the preceding practices of Dutch mariners in organizing their long-distance voyages. The direction of the enterprise was confided to the chief stockholders, the *bewindhebbers*. They alone made the decisions on how many ships would be sent out from each port, with what cargoes and instructions, and then how the return cargoes would be sold off and how the proceeds would be distributed. Profits could either be reinvested in further outward voyages or distributed to the various shareholders, the *participanten*. The *participanten*, if disappointed in the dividends, could demand back their share capital and withdraw from the enterprise, which was set up originally on the model of previous companies organized to trade with the East Indies, the so-called *voorcompagnien*. By 1609, however, the directors of the VOC declared the capital to be nonrefundable, so disappointed shareholders from then on had no recourse but to sell their shares to someone else. The capital of the VOC was divided up into fixed proportions among the six participating cities. Half was allocated to Amsterdam, one-fourth to Rotterdam, and one-sixteenth to each of the remaining four chambers of the VOC: Delft, Enkhuizen, Hoorn, and Middelburg. That division of capital meant, logically, that each of the four smallest chambers could have one director, which their own court of directors would appoint, while Rotterdam would have four directors, and Amsterdam eight. To keep Amsterdam from having an effective veto on any project it did not approve of, however, a seventeenth director was added, making the court of directors the *Heren XVII*. This last director rotated among the other five cities. As the local authorities in each city played a major role in selecting the *bewindhebbers* for their chamber, control of the VOC was effectively taken from the shareholders. From that point forward, shareholders could only be interested in the shares for their usefulness as financial assets; shareholding gave one no influence over the decision-making authority of the directors. The attractiveness of the financial asset, then, lay in receiving a satisfactory rate of return on it, either in the form of dividends or in capital gains, and, it turned out, in the ease of transferability of the asset—its liquidity. Liquidity, in turn, depended on the size and diversity of the customer base for the asset and the quantity of shares available for transfer. This varied, however, considerably among the six cities, given the highly unequal division of the capital stock of the company among them.

The capital paid in by shareholders in each city was registered in its own ledger, meaning that the Amsterdam chamber had in its ledger twice the amount of transferable shares as in the Rotterdam chamber, and eight times the amount available in the four remaining chambers. Not all the capital in any of the chambers was available for transfer, of course, because each director was required to hold 6,000 guilders of stock (3,000 guilders for the directors from the West Friesland towns of Hoorn and Enkhuizen). In addition to the *Heren XVII* who oversaw the entire operation of the company, each of the six chambers had its board of directors as well—twenty for Amsterdam, twelve for Rotterdam, and seven in each of the four smaller chambers—sixty in all, although the original number began at seventy-six, the number of directors already operating the six *voorcompagnien*. The directors' shares meant that a total of at least 360,000 guilders or 5.6 percent of the total capital stock was not available for purchase by new investors from 1622 on. By 1622,

VVY ondergheſchreven van weghen de Camere der Ooſt-Indiſche Compaignie tot Enckhuyſen, bekennen by deſen ontfanghen te hebben vanden E. Jan Brouwer tot Amſtelredame by transport vd Jan Jansz Dolphyn de ſomme van — Vijf Hondert gl. clavier — — —

however, when the original charter of the company was up for renewal, a new group of sixty "principal shareholders" was added who were supposed to observe the meetings of the *Heren XVII* and express support for the interests of all shareholders, even though they had no votes. From 1623 on, then, over 11 percent of the capital stock was not available for transfer, save from one retiring or resigning director or principal stockholder to his replacement. Nevertheless, the initial capital was fully ten times that of the competing English East India Company, also established in 1602, so the amount of transferable stock in the VOC was by far the largest amount of homogeneous, readily transferable financial assets available to European investors.

While the capital of the English company was only available to English citizens, the capital of the VOC was, in principle, available to anyone capable of paying for a share and registering it in the stock ledger of one of the six chambers, either in person or by letter of attorney. After all, stockholders had no voice in the operation of the company, or voting power for election of the directors, and it was clearly in the interests of the original stockholders to have as large a market as possible for their shares in the event they wished to cash out. In fact, however, very few foreigners signed up at first. Van Dillen found three Germans and two Italians, all investing substantial amounts, however.[4] It was not until William III became King of England in 1689 that similar provisions were made in the charters of the companies he caused to be chartered, mainly the Bank of England (1694) and the New East India Company (1698).

The need for a secondary market for the VOC stock soon became apparent as the original expectations of stockholders were repeatedly dashed during the first twenty years of the company's operations. Over one thousand individuals subscribed to shares in the Amsterdam chamber, ranging in amounts from 85,000 guilders to 20. The number and variety of investors involved meant that an active trade in the shares could develop if delays occurred in returns on the capital and if calls on capital occurred at moments of liquidity shortage for some individuals. Indeed, each year while the full capital of the company was being accumulated, some 6–7 percent of the capital of the Amsterdam chamber changed hands, and by 1607 fully one-third had been transferred from the original owner.[5]

The six *voorcompagnien* had already acquired the capital needed to equip their respective ships for the 1602 sailing when the united company was chartered, so they decided to put that capital into the VOC and sail all their ships together as one fleet. The original shareholders were told they would then have to share alike in the combined results of all fourteen ships but could have their money back if they wished to withdraw from the enterprise. For future expeditions, then, capital was to be accumulated for ten years, when it would be expected that a general liquidation would occur and a new capital fund begun for the following ten years. At the end of that period, which was also the end of the company's original charter, that capital was also to be liquidated. There seemed to be no thought yet of a permanent capital stock, but clearly the length of round-trip voyages (an average of eighteen months including stops at the Cape of Good Hope both on outward and inward legs), added to the time for outfitting the ships and disposing of their cargoes upon return, made it obvious that a much longer time horizon was needed for investors in the Asian trade.

Even so, the directors refused to liquidate the capital of the company in 1612 as originally planned and expected, and did not pay any dividend at all until 1610 and then paid it in kind, off-loading a surfeit of mace that had been brought back to the company's warehouses. A number of shareholders refused to accept it at all. Cash dividends were paid in 1612, 1613, and 1618 but no accounting of the company's operations was made

DOntfangers der Ooſt-Jndiſche Compagnie gelieven te betalen
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Actum in Middelburgh.

Ick ondergheſchreven bekenne vande ~~boven-ſtaende~~ [illegible]
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voldaen te zijn, Actum in ~~Middelburgh~~ Amſterdam den 9 November 1623.

Dominicus van Heemſkerck

WY onderſchreven Reecken-meeſters vande Camere der Ooſt-Jndiſche Compagnie binnen Middelburgh, Bekennen midts deſen gheaccordeert te hebben, ende by den Ontfangers der voorſchreven Compaignie ontfanghen te weſen, vanden Eerſamen Heer Dominicus van Heemſkerck de Somme van [illegible] Welcke voorſchreven ſomme van £ 1333 : 6 : 8 metten Intereſſe van dien jegens . 6 1/4 ten hond. Int Jaer gherekent, wy aen voorn. Heer Dominicus van Heemſkerck ofte den Thoonder deſes, door ditto Ontfangers wederomme belooven te betalen over . 100 acht Maenden naer date deſes. Sonder argh ofte liſt. Actum in ~~Middelburgh den~~ Amſterdam den 26 October 1622 — [illegible]

£ 1333 : 6 : 8

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Corneeus Cranckey.

available to the shareholders. Moreover, dissatisfaction with the militant nature of the company's operations in the East Indies, which threatened reprisals to Dutch merchants operating lucrative trades in other overseas locations, especially the Baltic, led to sharp fluctuations in the market price of VOC shares. The largest individual shareholder at the outset, Isaac Le Maire, one of the exiled merchants from Antwerp who had resettled in Amsterdam, led the first recorded "bear" operation against the company's shares in 1610. Le Maire had invested no less than 85,000 guilders at the outset, although the primary focus of his enterprises was in the Baltic trade. In general, the recent *émigrés* from Antwerp were the largest investors in the VOC and focused their holdings in the Amsterdam chamber, so any operation coordinated by Le Maire among this group could manipulate readily the price of shares on the Amsterdam market. Backed by the municipal authorities, however, as well as the States General, which could see the strategic value of the success of the VOC for increasing the long-run profitability not only of the Asian trade but also of the Baltic and Mediterranean trades, the bear operation was foiled and management remained firmly in control of the company's destinies. One problem plaguing the syndicate, apparently, was that its forward sales were typically for one year, which allowed enough time for counter movements to be organized by the directors. Indeed, it appears that the bear syndicate's share of total transfers of stock in the Amsterdam chamber of the VOC amounted to less than 20 percent and fell to 11 percent in 1610.[6]

Lacking effective voice in the management of the company, shareholders appeared motivated to hold their shares solely for the prospect of dividends and capital gains. Dividends did appear then irregularly, sometimes in spices, sometimes in gold, but usually were substantial. The most authoritative estimate is that from 1602 to 1650, the company paid out a dividend that averaged 16.5 percent per annum. Over the entire period, fully 99 percent of the company's net profits were distributed to the shareholders, so Le Maire's bear operation had at least one salutary effect for them.[7]

The question arises, then, how did the Dutch East India Company finance expansion of its activities over the next two centuries if it constrained itself from increasing the size of its capital stock? The answer must be that it could issue debt on its own credit, publicly regarded as sound by the very size and generosity of its annual dividends. Certainly, the company never permitted outsiders, or even stockholders, to see its account books. Some of the debt securities issued by the company have survived, however, and they provide a means to understand the terms on which the VOC borrowed. The example shown at left is of a medium-term bond issued by the "account-masters" of the Middelburg chamber of the East India Company on October 26, 1622, to Heer Dominicus van Heeringhoogh [?], bearing an annual interest of 6.25 percent per annum. On the reverse side, the principal sum of 1,333 guilders, 6 schellingen banco, and 8 groaten is paid off by the administrators of the East India Company on November 9, 1629.

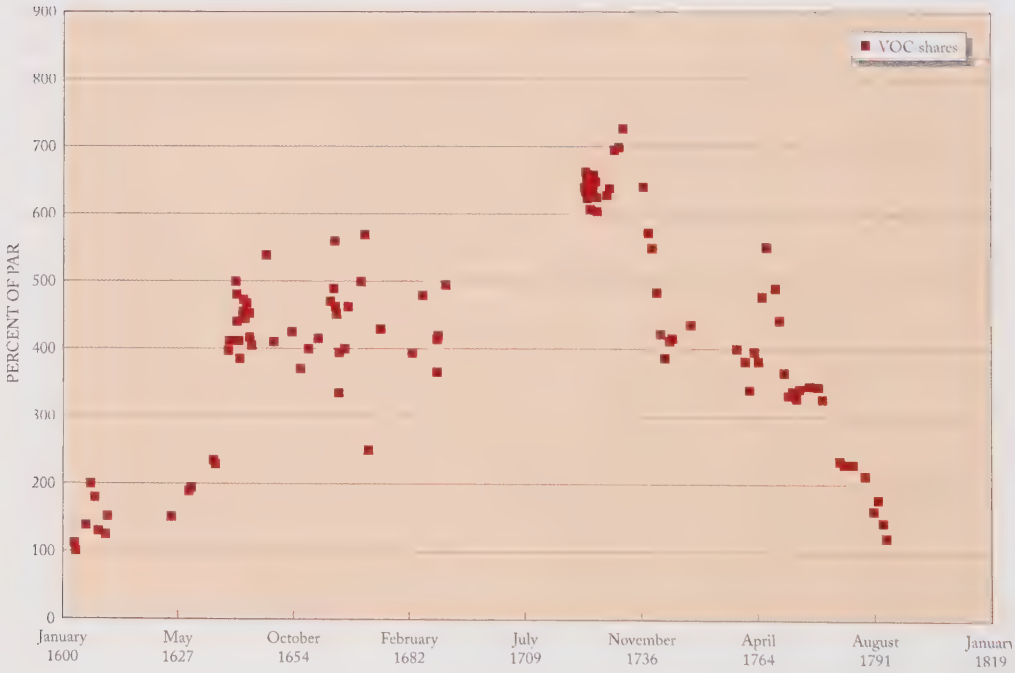
The outstanding debt of the company rose gradually over the seventeenth century, remaining at a ratio to its capital stock of around two to one (see graph 9.1). The company's bonds were issued by the individual chambers, mainly Amsterdam. When the general

Bond of the Dutch East India Company. Issued October 26, 1622, redeemed November 9, 1629. The Dutch East India Company, founded in 1602, was mostly financed by equity investment but the firm occasionally issued debt as well. This printed bond is a two-year loan issued in 1622 at a rate of 6.25 percent per year. The line through the text indicates that the debt was repaid and the bond retired in 1629. It represents an important stage in the history of finance because it is a financial obligation of a corporate entity as opposed to the obligation of an individual or a government.

GRAPH 9.1.
DEBT EQUITY RATIO OF THE VOC, 1602–1796

Ratio of the total equity value of the VOC to the outstanding face value of the debt.

GRAPH 9.2.
VOC SHARE PRICES, 1602–1796



Market prices of VOC shares on the Amsterdam Exchange

company began issuing its bonds, supplemented by short-term anticipation warrants at the end of the seventeenth century, the overall debt-equity ratio declined below 2—and the prices of shares in Amsterdam began a rapid climb to over 700 percent of par by the early 1730s. At that time, however, the debt-equity ratio began to rise to permanently higher levels and the price of shares began a permanent fall; both phenomena reflected the increased competition faced by the company in both its intra-Asian trade and its Asian-European trade by other European competitors, mainly the English. Finally, the results of the Fourth Anglo-Dutch War in 1784 leading up to the collapse of the mercantile republic in 1795 and the wrapping up of the VOC in 1796 under the wartime pressures of the revolutionary Batavian Republic are visible in the vertiginous rise of the debt-equity ratio and the collapse of share prices at the end of the eighteenth century (see graph 9.2).

Because the shares were registered in the names of each individual in the company stock ledger, with space for recording on the right-hand side the purchases of stock and on the left-hand side the sales of stock, title was easily verified and transferred. The only impediment to transfer was the infrequent times when the clerks of the company were allowed to open the books, usually for the distribution of dividends. Therefore, a forward market for actual transfer of title to a given amount of stock developed in the Amsterdam Exchange, which allowed trade in the shares to carry on freely until the transfer books were opened. Then settlement of accumulated trades could be made, an occurrence that became quarterly, at the so-called *rescontre* dates.

Forward trading, of course, implied some risk taking about the market price that would prevail up to three months ahead, and it makes sense that ways would be devised to allow individuals to offset that risk. Joseph de la Vega described in exquisite detail the importance of *Opsies* in the Amsterdam stock exchange at the beginning of his first dialogue among a stockbroker, a merchant, and a philosopher. The evaluation of risk over the interval between striking an option contract and completing it then became the fundamental source of the eponymous "confusion of confusions" that often prevailed in the stock market. Lack of trading opportunities in the underlying stock, apparently, led the active corps of stockbrokers to start rumors of war, peace, safe voyages, shipwrecks, market gluts, market shortfalls—whatever was deemed useful to create a movement in the share prices.

No doubt that was a major source of the occasional disruptions to the market for VOC shares, and a source of increased demand for options trading. But another source of demand quickly appeared and was possibly more important as the fundamental market determinant for options. Merchants who needed cash loans to outfit a ship, pay contractors, or maintain storage of their inventory until market prices rose for their commodities could now pledge as collateral their share in the VOC. Chapter 11 documents how one leading Amsterdam merchant, Hans Thijs, took advantage of the VOC venture shares to raise large sums of cash from a wider range of lenders, extending his credit network well beyond the narrow circle of family and close business associates who loaned him money before he acquired his VOC stock. If this practice was common, and there is every reason to believe it was given the frequent references to such contracts in the notarial archives of Amsterdam, then the lenders on VOC stock had every motive to protect themselves against a decline in the market price of the stock by purchasing options. The use of VOC shares by Hans Thijs as collateral for loans from a wider and wealthier potential group of lenders meant that the rate of interest he had to pay fell, and fell as well for loans he still had from family and business associates. Either his previous lenders had to meet the terms of the new competition, or, like the new lenders, they were reassured by holding his pledges of VOC stock.

Previously, Dutch merchants had pledged as collateral for their short-term loans any of the various annuities issued by the various cities, provinces, and even the States General of the Netherlands. But as these were not easily transferable, and were quite diverse, there was no regular market for trading them; hence, there was no way that lenders could take full value of them in case of default. Necessarily, interest rates were higher on such relatively illiquid collateral. So the remarkable decline in Dutch interest rates in general at the beginning of the seventeenth century, a trend widely remarked on and envied by contemporary observers in England and France, may well be due in large part to the creation of transferable share capital in the Dutch East India Company.

Evidence to support this proposition comes from the experience of the English when they adopted many Dutch financial practices after 1688. The Dutch and Jewish advisors to William III, the new Protestant king of England and still Stadholder of the United Provinces of the Netherlands, immediately put into practice in London's Exchange Alley the skills they had acquired in the Amsterdam Beurs. But excise taxes on the model of the Dutch provinces were resisted by Parliament, and the Bank of England was founded on quite different terms than the Bank of Amsterdam. Even the recoinage of 1696, brought about by the shipping of full-bodied coins to Amsterdam during the Nine Years War, was not modeled after the obviously superior minting policies of the Netherlands.

The share capital of the new chartered companies created under William and Mary, however, was explicitly created on the Dutch model. Dickson remarks that the stock ledgers of the Bank of England and its transfer books with printed forms were identical in format to those of the Dutch East India Company in Amsterdam.[8] In its early years, the Bank of England started a special ledger to record pledges of bank stock as collateral to lenders.[9] The register was opened in response to an Act of Parliament passed in 1697 that no agreement for changing the status of Bank of England stock would be legally binding unless recorded in books maintained by the Bank. While the register was maintained until 1721, it was used mostly for the remainder of 1697 when fifty entries were made, falling off to eleven in 1698 and nineteen in 1699, and tapering off rapidly to one each in 1703 and 1704. Evidently, other means of enforcing transfer of bank stock when pledged as collateral were found to be effective. Certainly, the trading activity in bank stock continued apace. For example, no fewer than eight thousand individuals possessed varying amounts of bank stock at some time during the period that lasted from 1720 to 1725. Moreover, interest rates paid by merchants on short-term loans fell in England after the creation of easily transferable capital stock in the Bank of England and the New East India Company, just as it had earlier in Amsterdam after the creation of the VOC.[10] By 1730, interest on short-term borrowing by the English East India Company had reached the mercantilist ideal of 3 percent, the same as in the Netherlands. Dickson comments that the English had achieved the same kind of reduction in interest as the Dutch, but from much less favorable levels and more rapidly.[11]

What remains as a puzzle is why the most successful implementation of a long-term capital market complementing an active short-term capital market should have taken place in London after a century of delay, rather than in Amsterdam, which had enjoyed the fruits of early financial capitalism so spectacularly in its golden age of the seventeenth century. The answer probably lies in the relatively fragmented nature of the Dutch political structure. National debt did not appear in the Netherlands until it became a kingdom under Napoleonic rule in the early nineteenth century. No other joint-stock company appeared at anywhere near the size of the Dutch East India Company. Indeed, unlike the Bank of England and the English East India Company, both of which enlarged greatly

the size of their capital stock during the eighteenth century, the capital stock of the Dutch East India Company remained fixed at its original level until the company was dissolved formally in 1796 by the Batavian Republic. It seems obvious that the efficiency of a financial asset for purposes of generalized collateral depends upon the size of the asset and the number and diversity of its possessors. Otherwise, the possibilities for an effective secondary market in the financial asset are limited. Indeed, after the expansion of British national debt, especially after the South Sea bubble of 1720, even the Dutch merchants increasingly to using British securities as collateral for their loans.[12]

A deeper reason for the greater eventual success of the British imitation of the Dutch innovation, perhaps, and one that is more general, is that the English adopted this particular financial innovation of the Dutch in its purest form, without the limitations on the size and liquidity of VOC stock that Dutch political conditions had imposed. Thus, the entire capital stock of the Bank of England, the English East India Company, and later the South Sea Company were available for transfer at their head offices in London. By contrast, only half of the VOC capital stock was available for transfer at the main office in Amsterdam. Transfers of stock were possible daily in the English companies and later for transfers of national debt administered by the Bank of England, unlike in the Netherlands, where transfer books were opened only monthly or quarterly. The amounts of stock required by directors of the English companies were limited, as were the number of directors. Foreigners were encouraged to invest, and were even allowed to vote for directors if they held the minimum amount of stock required. And the directors, of course, were renewed annually in elections by stockholders.

In the evolution of financial innovations a new technology is often used more effectively by a country that picks it up than in the original country of invention, precisely because the follower adopts the pure form of the innovation, stripping away the incrustations of local practices and encumbrances acquired in the era and country of origin. The financial innovation of joint-stock capital in long-distance trading companies in early modern Europe seems to follow this course.

10

Perpetuities in the Stream of History

A Paying Instrument from the Golden Age of Dutch Finance

WILLIAM M. GOETZMANN
AND K. GEERT ROUWENHORST

In 1323 Count William of Holland sent his army into the town of Mijdrecht, located in the Diocese of Utrecht, to expell its population and burn down the city. The dikes protecting the low land from the water of the Lek River had broken twice in 1321 and 1322, flooding not only Utrecht but also a large portion of William's territory. When repeated appeals to the Bishop of Utrecht to make the necessary repairs failed, William resorted to military force to convince his neighbors to sign a charter regulating the upkeep of the waterworks around the Lek in Utrecht. The agreement between Holland and Utrecht marked a reorganization of the *Lekdijk-college*, one of the oldest water boards in the Netherlands.[1] While their exact timing is disputed by historians,[2] these events illustrate why water boards are among the oldest public institutions of the Netherlands: flood plains of rivers rarely coincide with state borders, and water management calls for organizations that transcend jurisdictions.

As the Dutch population expanded during the Middle Ages and lowlands were cultivated, the number of water boards rapidly expanded. During the nineteenth century it is estimated that there were as many as 3,500 water boards in the Netherlands. Due to mergers their number has declined to about fifty-seven today.[3] Traditionally, the daily management of the boards (*hoogheemraadschappen*) has resided with the dike reeve (*dijkgraaf*),

an official appointed by the sovereign, who is assisted in his task by a committee of oligarchs representing the landowners in the region (the *heemraden*). The boards were granted the power to draft citizens into a dike army to stand watch on the dike in case of a threatening breach and assist in performing necessary repairs. Water boards were financed through taxation of landowners in proportion to their holdings and sometimes proximity to the dike. During years of frequent breaches—as, for example, in 1624 and 1638–1639—the tax proceeds would be insufficient to cover the necessary outlays. The *cameraer*, who was appointed to oversee the finances of the water board, would finance these deficits through the issue of bonds (*renten* or *rentebrieven*).[4]

Oldest Surviving Perpetuities

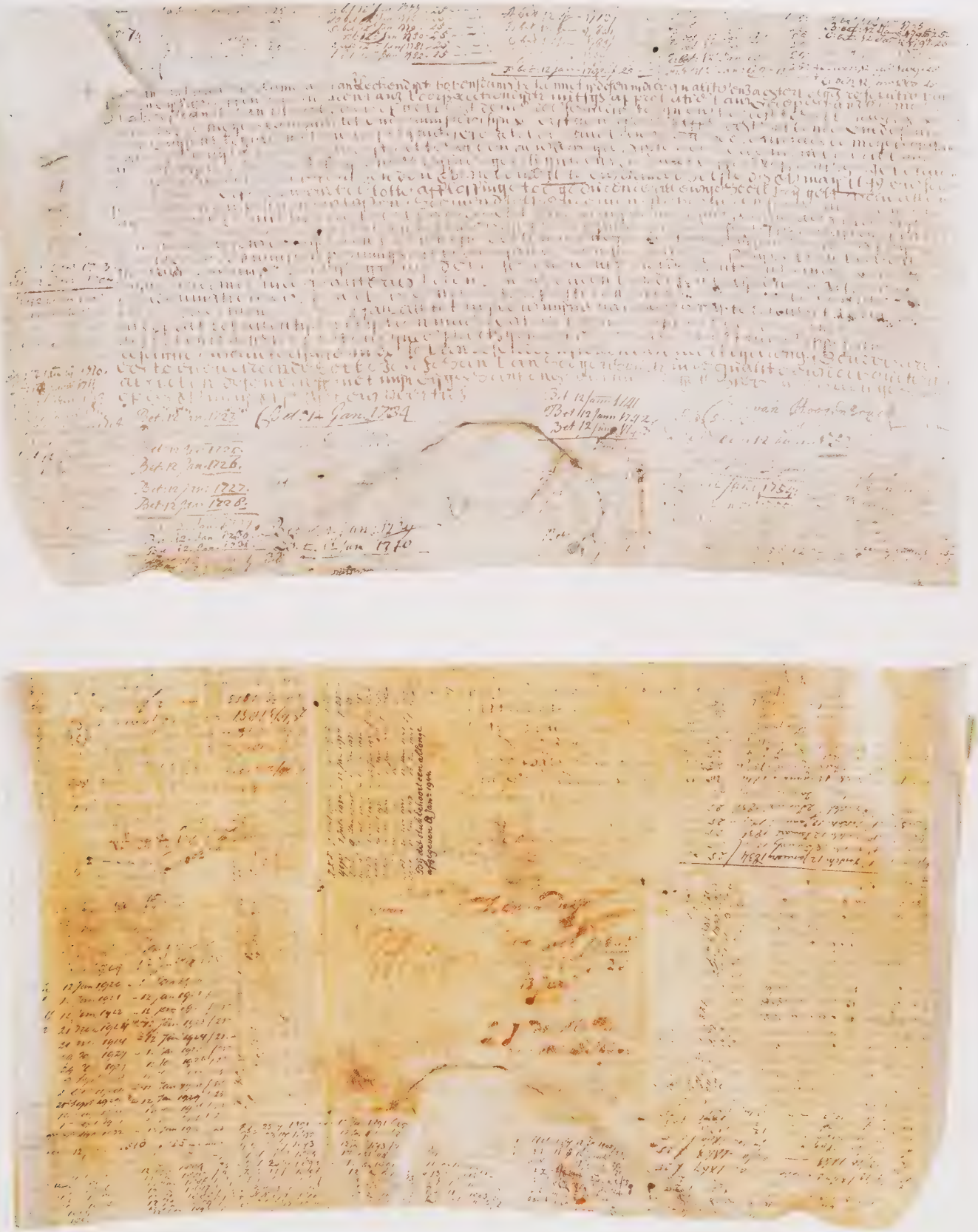
Hoogheemraadschappen occupy a special place in financial history, because a small portion of the debt that they issued centuries ago is still being serviced today. The securities from that period are among the oldest "live" securities in modern capital markets. All of the seventeenth-century water board bonds that are known to currently pay interest were issued by the *Hoogheemraadschap Lekdijk Bovendams*, which was responsible for a 33.5 kilometer stretch of dyke between *Het Klaphek* and *Amerongen*. The organization's title explains its location. Lekdijk means the Lek dike and Bovendams indicates that it was responsible for the dyke above the dam near Utrecht.

At least four bonds from the *Hoogheemraadschap Lekdijk Bovendams* have been presented to its successor organization, the water board of Stichtse Rijnlanden, for payment in recent years. The oldest of the four bonds dates from 1624, and currently resides at the Museum of Financial History in New York. Each bond specifically lists the purpose for which the proceeds are to be used. For example, the 1624 bond was issued to finance the repair of a dike breach near *Tull and 't Waal*,[5] and the proceeds from the 1648 loan were given to the workers employed at the third new *cribbinge* in the town of Honswijk. A *cribbinge* is a series of piers extending into the river at the outside of a bend, regulating its flow and preventing the natural processes of erosion that shift the riverbed.

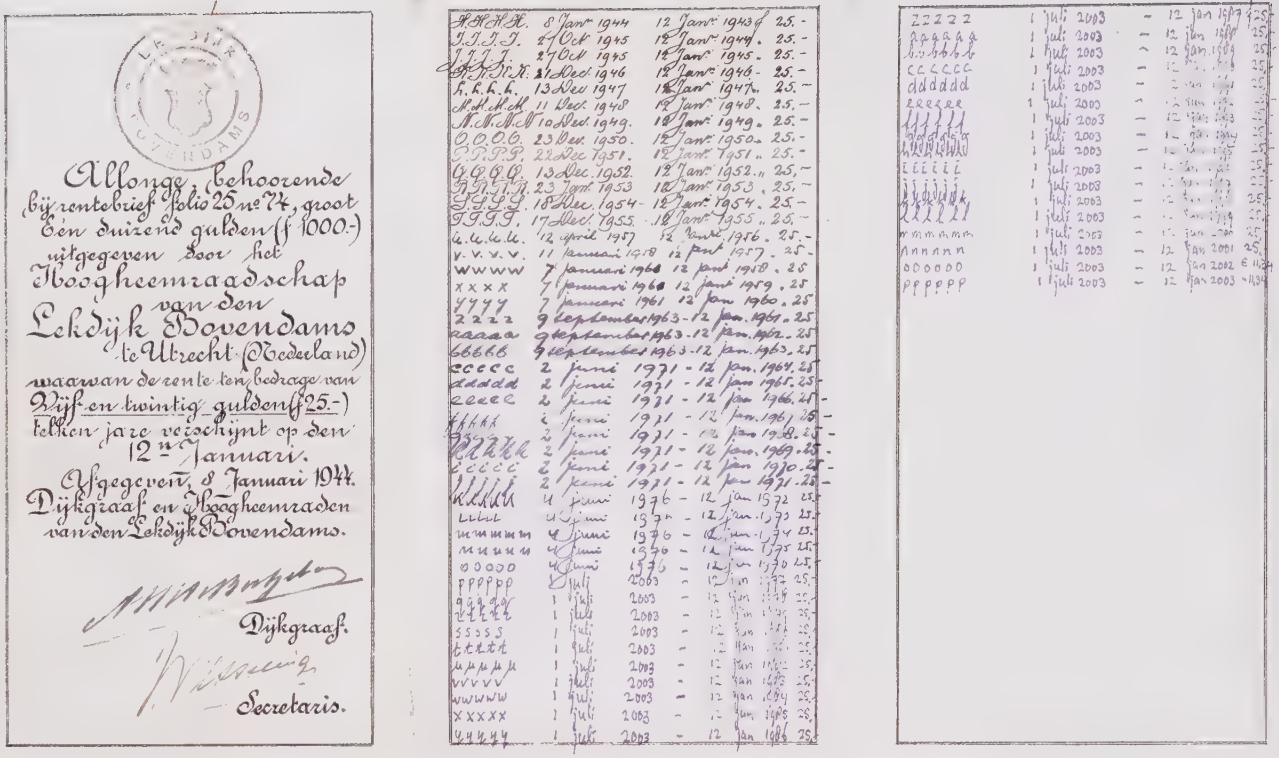
Water board bonds issued during the seventeenth century were generally in manuscript form, handwritten on vellum and signed by the *cameraer*. Interest payments were simply recorded on the document itself, and provided the only proof of payment. Most bonds were annuities redeemable at the pleasure of the board, but some were *niet byzondere obligaties* that were not redeemable. And although the *rentebrieven* mention the name of the initial lender, they were negotiable paper so that the interest would be paid to the bearer who presented the bond at the office of the *cameraer*.

The Terms of the Loan

The 5 percent manuscript bond, issued on May 15, 1648, reads that "I Johan van Hogenhouck, Cameraer of Lekdijk Bovendams, acknowledges to have received [. . .] from Mr. Niclaes de Meijer, Canonick tot Oudemunster, the sum of 1,000 Carolus Guilders of 20 Stuivers a piece." Perhaps because the notion of a legal entity was still evolving in Europe at the time, the *cameraer* borrowed on his personal account, with the understanding that he did so as part of his function at the water board and with the approval of various representatives of the state. The money was owed to Mr. de Meijer, his heirs, or other rightful persons, indicating that the obligation was transferable. The manuscript reads that 50



Perpetual 5 percent manuscript bond for 1000 guilders issued by the Water Board of Leckdijk Bovendams. May 15, 1648. This is one of the oldest surviving securities that has paid interest into the present. It was issued to finance the repair of the dyke running along the Lek River near the town of Honswijck. Interest payments were continuously recorded on the vellum document until the twentieth century, when an allonge was issued to record the additional payments (see next page). The last recorded payment was collected by the author on July 1, 2003.



guilders of annual interest will be paid, half on November 15, 1648, and half on May 15, 1649, and likewise each following year in perpetuity until redemption of the bond. Because the obligation is in bearer form, any rightful person who presents the bond at the water board could collect the interest. Five percent annual interest was consistent with the prevailing rate on bonds issued by the Netherlands. In 1644, interest on the Dutch national bonds had been reduced from 6.5 percent to 5 percent.[6] Thus, the water board security appears to have been regarded by buyers as equivalent in risk to the national debt. The document is unnumbered, and a detailed record of the number of bonds outstanding does not exist. Interest payments were recorded on the document and constituted evidence of payment. Over time, numerous interest payments exhausted the empty space around the main text, and eventually an allonge was added to the security, listing payments since 1944.

Interest on the bond has indeed been paid for more than 350 years. One of the authors, Geert Rouwenhorst, personally collected the twenty-six years of back interest on July 1, 2003, but there have been two partial defaults on the original promise. On January 1, 1700, the interest rate was reduced to 3.5 percent and later in the eighteenth century it was reduced to 2.5 percent, to be paid annually.[7] Also over time the Carolus guilder has been replaced by the Flemish pound, the guilder, and most recently by the euro. Currently the *rentebrief* pays euro 11.34 annually. Three hundred fifty years of inflation and partial defaults have considerably reduced its value as an investment.

The relative financial autonomy of water boards and their cousins the "polder boards" insulated them from the fortunes of the central government, and explains why the perpetual securities issued by these organizations have survived until today. Perpetual loans have

a much longer history, of course, but their effective lives have typically been cut short by imprudent financing, government recall, or the misfortunes of wars and revolutions: the French Revolution ended perpetual loans issued by the *Hotel the Ville* and the *Compagnie des Indes*, and the Russian Revolution led to default of the 1822 rouble-sterling perpetuity, issued by the House of Rothschild, after 95 years of debt service.

Early History of Perpetuities

As ancient as the *Lekdijk Bovendams* debt instrument appears to our modern eye, it actually has a long historical precedent in Europe. Economic historians have traced the development of perpetuity and annuity-like instruments to before 1000 A.D. and documented the progressive development of long-term debt from the end of the Middle Ages through the Renaissance and into the modern era.

Contracts for a stream of future payments similar to bonds existed in Carolingian times, in the form of financial arrangements made with ecclesiastical institutions. Monasteries and churches received land from donors in exchange for the continued future yield of the property. Bruno Kuske, for example, documents a number of such gifts associated with life rents and heritable future rents.[8] Donors gave their vineyards, houses, and fields to the church in exchange for payments from the yield of the lands during their lifetimes and, typically, a perpetual annual mass or prayer for their souls after death. Kuske argues that later state-issued debt contracts had their legal and financial roots in these early monastic contracts. In the early second millennium, contracts in which a landowner received a lump-sum payment from an investor in return for a stream of annual future payments—either for a fixed number of years or in a perpetual, heritable stream—became institutionalized throughout Europe in the form of *census* agreements and *rentes*.[9]

John Munro convincingly argues that medieval *census* contracts, based on agriculture, were the precursors to municipal debt in France, Spain, and Italy in the twelfth and thirteenth centuries and represent a financial solution to the theological objections to charging interest.[10] In particular, the nonrefundability of the original investment protected the contract from regulation under usury laws. In the eyes of the Church, without repayment, there was no loan, and the *census* income stream was thus not defined as interest.

By the late twelfth century, towns in Italy, France, and Spain had begun to issue *rentes* and similar debt instruments using the same financial structure as the *census* contracts. For example, in northern Italy, Genoa borrowed to finance maritime battles as early as 1149, and the following year restructured her obligations as a long-term fixed payment backed by taxes.[11] Venice issued her first long-term public debt in 1172, and the practice extended to other Italian city-states in the later decades of the twelfth century. Chapter 8 highlights the differences that arose in the role that early Italian public debt played in city politics and finances, and the differing financial institutions that developed to manage civic indebtedness. Because chapter 8 devotes considerable attention to describing the development of the bond markets in the Italian city-states, we will not detail them here. One key feature of note, however, is that Venice, Italy, and Genoa all issued long-term debt structured very much like the *Lekdijk Bovendams* perpetuity. That is, they issued contracts to bondholders (sometimes forcibly) in return for promise of annual payment of interest. These bonds were transferable in some cases. The Rialto area of Venice was arguably the earliest bond market, where agents would broker the transfer of state obligations among citizens.

Issuing Entities

While it is understandable to view the development of urban indebtedness in Europe as a natural extension of monastic contracts, James Tracy, a historian of early European finance, points out that the secular roots of *rente* contracts may be as important as their ecclesiastical antecedents and indeed may be important from the point of view of legal history. Tracy identifies the earliest French *rente* in Rheims in 1218, and documents a large number of similar issues by other French and nearby Belgian towns within the following two decades. He argues that the appearance and widespread use of perpetuities and life annuities in the early thirteenth century in France was no accident. Unlike the communities in southern France—some of which were under English rule, the northern French cities enjoyed explicit recognition as legal entities—like corporations—which could formally contract in the name of their citizens. As Tracy puts it, "royal jurists established the principle that urban communes were one of the few forms of association privileged by the king to act as moral persons."[12] Which came first, the legal entity of the commune or the need to borrow? The fact that urban debt financing and the concept of the legal entity evolved jointly in France and nearby countries at this time suggests that financial technology may have played some role in the formalization of an important legal concept that remains vital to municipal and corporate finance to this day.

Chapter 2 suggests that similar governmental recognition of an entity developed in ancient Rome for purposes of financing large-scale public works and enterprise. Separated from the developments of urban communes in northern Europe by more than a millennium, it is hard to imagine a continuity of such legal traditions. Rather, these parallel developments may suggest that recognition of organizations or communities as legal entities can arise as a natural solution to economic problems. In the case of the *rentes* of the thirteenth century—or the *Lekdijk Bovendams* bond of the seventeenth century—the problem was how to finance large-scale expenditures for the public good. Curiously, the contracting entity in the *Lekdijk Bovendams* bond was not the company itself, but Johan van Hogenhouck. This suggests that despite the precedent of the Dutch East India Company, even by the mid-seventeenth century some organizations like the water board—as opposed to an urban commune—still may have required a personal representative to contract in its name.

An Investor Revolution

Debt financing grew to immense proportions from the thirteenth to the seventeenth century in Holland. By the sixteenth century, municipal accounts of towns in the low countries reveal that a significant portion of the annual income of Dutch cities went toward servicing annuities and perpetuities, many of which were held by investors from other towns and countries.[13]

Although attention has focused on the political implications of this growing debt burden in Holland through the seventeenth century, that is only one facet of the development in financial markets during that era. Another facet, of course, is the extent to which these new markets benefited investors. Every guilder of debt incurred by national authorities, municipal authorities, and public works companies represented a corresponding guilder of assets in the portfolios of an ever-increasing population of investors throughout Holland and beyond. Investors large and small could put their capital to work in a manner not possible before these financial markets existed. Life annuities could ensure a steady income for pensioners, children, and widows until death. Perpetuities could become a source of finan-

cial support that could be passed to future generations. Perpetuities and annuities were not only sold to the wealthy classes but were also widely offered to people of modest means. For example, the city of Amsterdam's bonds in the period 1578 to 1605 were sold in quantities of 50 guilders face value to members of the working classes.[14] This is twenty times smaller in face value than the *Lekdijk Bovendams* instrument. Laurence Derycke argues that this democratization of finance may have begun in the low countries as early as the fifteenth century. His careful study of the buyers of perpetuities and life rents issued by the city of Bruges during this period shows that while the monied classes of the city were an important source of credit, regularly subscribing to large blocks of bond issues when they were offered, craftsmen and members of the various town guilds—butchers, fishmongers, bakers, builders, and leatherworkers—all bought Bruges debt in significant numbers.

Foreigners were yet another significant class of investors, some of whom apparently purchased life annuities for illegitimate children and concubines, perhaps to prevent such investments from showing up on the books in their own municipality.[15] The capacity of the Dutch middle class to underwrite the expenses of the government through a sustained demand for debt was the envy of other countries and was perceived as a national strength.[16]

Liquidity

With vast fortunes invested in government and municipal securities, it is likely that there was an active secondary market for debt in Holland in the seventeenth century. On the other hand, it is difficult to precisely date its appearance. For example, the *Ledijk Bovendams* bond was certainly designed to be transferable, so the existence of a secondary market was possible in 1648, but not documented. James Tracy argues that the very magnitude of the municipal debt in Holland led inexorably to an active market for loans. He suggests that Antwerp became northern Europe's first important money center because it served as a capital market for the issuance of debt obligations by Dutch and Belgian cities and civic authorities.[17] On the other hand, Violet Barbour conjectures that active trading of government and municipal bonds did not really begin in the Netherlands until the 1670s—stimulated, perhaps, by the French invasion of the low countries in 1671 and the resulting sudden risk of government loan default. Over the course of two years during the financial crisis, market quotes in Amsterdam for Dutch government debt show short-term price drops of as much as 20 percent.[18] One conjecture is whether the value of water board bonds fluctuated as much as the national bonds. A war might have affected the Dutch government's ability to pay, but, as the 1323 expedition of Count William of Holland suggests, support for the hydraulic infrastructure of the Netherlands trumped even national needs. Unfortunately we cannot test this conjecture—market records from the 1670s have no mention of the *Lekdijk Bovendams* perpetuities.

Diversification

It was not only widespread issuance of the financial instruments—nor even their liquidity—that changed economic life in Holland in the seventeenth century, but the sheer number and variety of available contracts. Virtually all of the major urban centers in Holland issued life rents and perpetuities. As the fortunes of one city waned, the fortunes of another waxed, providing protection through diversification to the investor that held some debt of each. The city of Zutphen, for example, in east Holland engaged in trade with the Hanseatic League and developed a successful market for debt through the fifteenth and

sixteenth centuries—perhaps in part due to the fact that their *rentes* and other debt obligations were fixed in gold, and thus not subject to devaluation through monetary debasement. Poor debt management, however, laid the fortunes of the city low by the end of this period, even as competing cities like Amsterdam were in their ascendancy.[19]

Many Dutch investors were astute enough to avoid putting all of their eggs into a single financial basket. Although often obliged to take up subscriptions of municipal debt where they resided, bondholders bought obligations of neighboring and distant cities. One of Amsterdam's leading citizens of the seventeenth century, Louis Trip, left a large estate of financial securities to his beneficiaries in 1684. Although the bulk of his investments were in bonds of Holland, he had 14,000 florins invested in a variety of debt instruments issued by many different cities in the Netherlands.[20]

Why was such diversification important? Diversification allows investors to reduce the risk of an asset portfolio without reducing the return. A diversified portfolio is less exposed to disaster. It can provide a more reliable stream of future income than a portfolio comprised solely of *rentes* from a single municipality. As a larger percentage of Dutch investors attained access to the tools of diversification—that is, a variety of financial instruments at home and abroad—they could effectively eliminate a portion of the uncertainty in their economic lives. The public imagination associates seventeenth century Holland with "tulipmania" and the devastating crash in bulb prices in 1637. In fact, tulipmania has become synonymous with risky investment, speculative bubbles, and extraordinary fortunes won and lost. The truly revolutionary events in Holland in that century included not only the development of the modern corporation, the appearance of the stock market, and the invention of derivatives, but the widespread adoption of diversified investment portfolios by ordinary investors as well as wealthy ones. This "silent revolution" in seventeenth century Holland represented a fundamental change in the basic financial risks faced by individuals and their families. Using annuities, perpetuities, life rents and even corporate shares, investors could create a portfolio of relatively stable assets that would sustain them into old age and protect those who might not be able to earn an income through labor. Unlike traditional societies in which long-term security depended primarily upon the fortunes of an extended family, the financial revolution in Holland allowed individuals to master their own, independent economic destiny. Investment portfolios, if they were sufficiently large and diversified, might substitute for a family firm. Financial instruments in the golden age of Dutch finance became the potential foundation for economic self-reliance.

Valuation Tools

Given Europe's long history of investment in annuities and perpetuities it is not surprising that the mathematical tools to evaluate them developed concurrently with their increasing use.[21] Chapter 7 documents the early fourteenth-century development of the mathematics of present value around the time when cities first began to issue debt and life annuities were used as compensation by the state. Chapter 12 traces the early modern development of the actuarial tools used to value life annuities, which culminated in the invention of most of the modern tools of probability calculus. While the present value of an infinite stream of cash flows is implicit in both the early and later mathematical analyses, the first closed-form mathematical solution to the problem of perpetuity valuation remained unsolved—or at least mathematically unexpressed—until the seventeenth century. When the formula did appear, it played a role in some of the most important developments in finance and mathematics, and engaged some of the most brilliant minds of the era.

The first of these minds was the seventeenth-century polymath Jan de Witt, who completed his mathematical analysis of life annuities in 1671, shortly before the tragic end of his career as the prime minister of Holland the following year. As noted in chapter 12, de Witt's book *Value of Life Annuities in Proportion to Redeemable Securities* developed a method for relating the value of annuities to the age of the beneficiary. A key element in his analysis was the expression of the difference in value between a perpetual and a limited future cash stream, althugh his treatise did not include an explicit formula for a perpetuity. Although his book induced Amsterdam to issue life annuities priced on a rational basis in 1672, de Witt died at the hands of an angry mob that same year—apparently blamed for the French invasion of Holland.[22] Curiously, while de Witt's brilliant study played an important role in government finance and aroused intellectual interest among European mathematicians, it was famously difficult to find. Both Gottfreid Leibniz and Jacob Bernoulli, two of the leading continental mathematicians of the century, sought unsuccessfully to obtain a copy.[23] Were Leibniz and Bernoulli able to learn otherwise about de Witt's method of solution? In the case of Bernoulli, this would be particularly interesting to know, given his salient role in the history of mathematics and his own derivation and use of the perpetuity formula.

Jacob Bernoulli (1654–1705), professor of mathematics at the University of Basle from 1687 to the end of his life, was a member of an extraordinary family of mathematicians which collectively made important contributions to both mathematics and finance. Bernoulli's solution to the perpetuity problem is an elegant one, and is presented in a paper that, strangely enough, does not discuss financial instruments at all. Rather, Bernoulli's *Positionum Des Seriebus Infinitis* is concerned with a key issue in the problem of infinite series. Under what conditions can they be understood to converge to a noninfinite quantity? The convergence properties of infinite series were important in the development of the calculus, and Bernoulli's interest in them may have been stimulated by Gottfried Leibniz, with whom he corresponded. Leibniz, together with Isaac Newton, is credited with the development of the calculus, which relies, among other things, upon the summation of a near-infinite number of vanishingly small increments.

What happens to calculus equations with infinitesimal quantities when the near-infinite becomes infinite and vanishingly small becomes nonexistent? It is not difficult to see how the problem of perpetuity valuation could be understood as a particular example of this question. A perpetuity provides a stream of fixed payments stretching infinitely into the future. The annual payments due the owner of the *Lekdijk Bovendams* bond, for example, can be expressed mathematically as

$$V = \frac{50}{(1.05)} + \frac{50}{(1.05)^2} + \frac{50}{(1.05)^3} + \cdots$$

where V is the value of the bond, 50 is the annual payment due in guilders, and 1.05 is 1 plus the annual interest rate on the bond.[24] The first term in the series is the discounted value of the 50 guilders received a year from the present. The annual interest rate compounds, so that three years out, the discount factor applied to the 50 guilder payment is $1/(1.05)^3$. The three dots indicate that this expression goes on forever. Notice that each term to the right of the equal sign is a positive number, even though the discount applied to the 50 guilders keeps increasing. So how do we know that summing up an infinite series of positive numbers is itself a finite number? Is V really finite, and if so, what does this infinite series converge to?

Bernoulli's formulation of this problem allowed not only for a 5 percent discount rate, but also for a growth rate in the 50 guilders. He uses the algebraic symbol l for the payment, m for 1.05, and n for a growth factor applied to l.

$$V = \frac{l}{m} + \frac{nl}{mm} + \frac{nnl}{m^3} + \frac{n^3 l}{m^4} \cdots$$

Bernoulli observes that both sides of the equation can be multiplied by the ratio n/m and the resulting value can be subtracted from both sides, leaving

$$V - \frac{Vn}{m} = \frac{l}{m}$$

and, with some rearrangement:

$$V = \frac{l}{m-n} = \frac{l}{m} + \frac{nl}{mm} + \frac{nnl}{m^3} + \frac{n^3 l}{m^4} \cdots$$

In the simple case for which the annual payment is fixed, n is 1, and thus the *Lekdijk Bovendams* bond value would be given as $V = 50/(.05)$, that is, 1,000 guilders.

This calculation may not seem so interesting when the interest rate is equal to the rate at which the bond was issued; however, in a secondary market in which the interest rate (i.e., discount rate) may have changed, this formula indicates the new value for the bond. For example, in 1678, after the Amsterdam bond market had recovered from earlier worries of war, government bonds were selling at a 3.75 percent annual yield.[25] Assuming the dyke bond was still considered as safe as government debt, the perpetuity formula suggests that it could have sold that year for 50/.0375 or 1,333.33 guilders—well above its original issue price three decades earlier.

Did Bernoulli rely upon the earlier analysis of de Witt for his solution for this particular infinite series? If so, it is tempting to interpret this as evidence that financial mathematics played an important role in the more general development of mathematics. Bernoulli's broad assault on the convergence properties of infinite series was ultimately appreciated as an important step in mathematical analysis. It is interesting to note that Bernoulli worked on another important infinite series in finance as well: continuously compounded interest. In 1685 he took up a problem posed by Leibniz, which asks what will happen to the rate of interest on a loan when the interval of compounding decreases to an infinitesimal interval.[26] Today, the value of one dollar continuously compounded over the interval t at the interest rate r is given by e^{rt} where e is the base of the natural logarithm. Bernoulli's solution comes close to the modern value. Posed before the actual discovery of the constant e, it uses the mathematics of infinite series and shows that the exponentiated constant, which lies between 2 and 3, can be calculated to an arbitrarily accurate value through a straightforward numeric expansion.

Jacob Bernoulli's most famous work, summarizing the bulk of his contribution to the mathematics of infinites series, probability, and game theory, is *Ars Conjectandi*, a large work edited by his nephew Nicholas and published posthumously. Nicholas himself made an important contribution to financial mathematics. In 1709 Nicholas Bernoulli developed a closed-form solution to the valuation of life annuities, independently, it appears, of the work of Jan de Witt.[27] An important part of his solution was a simple expression for the

value of an annuity of fixed term, for example, an annual, fixed payment for a prespecified number of years. Nicholas's annuity formula was derived from Jacob Bernoulli's perpetuity formula, and is essentially the same one in common use today. Thus, by the beginning of the eighteenth century, the basic tools for the valuation of financial assets—the perpetuity formula, the annuity formula, and a formula for the valuation of life rents (life annuities)—had been developed, and the Bernoulli family played an important role in all three.

The story of the development of these valuation tools is interesting in itself, but the deeper question of whether finance was a stimulus to the solution of mathematical problems is also a potentially fruitful line of inquiry. It may not be coincidental that some of the major contributions to the mathematics of infinite series were made by scholars working on financial problems—from Leonardo of Pisa to Jacob Bernoulli.[28] Although philosophers and theologians in Bernoulli's time might have pondered the infinite as a concept beyond human grasp, the fact is that European investors had been buying and selling infinite streams in the forms of *cesus*', *rentes*, and perpetuities for centuries. Perhaps the experience of the infinite in daily economic life, evident in financial contracts throughout the seventeenth century, had an effect on more abstract, philosophical concepts of infinity—particularly in the Age of Reason that was soon to follow. At the very least, perpetual financial contracts became the basis for significant mathematical innovation. In order to understand the conditions under which markets not only develop but mature and deepen, we should perhaps continue to explore the fertile interplay between financial problems and mathematical solutions.

Conclusion

The *Lekdijk Bovendams* loan is one of the few perpetuities that has survived as an active financial instrument from the golden age of Dutch finance. Surprisingly, despite its antiquity, it was not a novel instrument for its time. Rather it represents the culmination of several centuries of financial development in Europe. This financial development has its roots in ecclesiastical contracts and was affected in important ways by the development of the legal entity. Holland, during the century of the bond's issue, was arguably the world's leader in financial innovation—not only because of the variety of securities and markets that it developed, but also because of the widespread access to these securities and markets enjoyed by all levels of Dutch society. Because of the range and variety of issuing entities in the seventeenth century, it was possible for investors to diversify portfolios to a much greater degree than in previous centuries. Indeed, with the trading of the Dutch East India Company shares in Amsterdam, it became possible for investors, maybe for the first time in history, to structure a portfolio balanced between stocks and bonds.

Undoubtedly spurred by the development of financial instruments and markets in late seventeenth century Holland, mathematicians of the day worked on the problems of valuation of financial instruments. Jan de Witt is credited with the first closed-form solution to the annuity formula, a solution that involved an expression for the value of a perpetual stream. Jacob Bernoulli's analysis of infinite series led to an early expression for the value of a perpetuity, an early formula for compound interest, and served as an important building block for the development of an annuity formula. These mathematical contributions were stimulated by practical financial issues of the day, and in turn, they led to the broader development of mathematical tools extending far beyond the practical challenges of the financial markets.

Appendix

TEXT OF THE 1648 MANUSCRIPT BOND ISSUED BY LECKDIJK BOVENDAMS

Ick Johan van Hogenhouck Cameraer van de Leckendijck bovensdams bekenne bij desen in dier qualite ende achtervolgende resolutie van de heeren dijckgraeffen ende heemraden van de voors. Leckendijck migts[aders] approbatie vande Gedep[uteer]den van de Ed[ele] mo[gende] heeren Staten s'landts van Utrecht daer op gevolcht deuchdel[ijck] schuldich te zijn ende vercoft te hebben aen den heere Niclaes de Meijer Canonick tot Oudemunster, sijn E[ersame] erffgen[amen] ofte des selffs recht hebbende om de somme van duijsent k[arolus] guldens van xx st[uivers] 't stuck, die ick bekenne van den voorn[oemden] Niclaes de Meijer ontfangen ende weder uitgekeert ende verstreect te hebben aen de arbeijders die aen de derde nieuwe Cribbinge in Honswijck waren arbeijdende, vijftich gel[ijcke] guldens des jaers erffel[ijcke] lossrenten ende te betalen d'eene helfte der selver renten den xvde novemb[ris] 1648 ende d'ander helfte den xvde maij 1649 ende soo voorts jaerl[ijck] erffel[ijcken] ende euwel[ijcken] totte afflossinge toe gedurende, all ende geheell vrij gelt van allen schattingen, impositien ende lasten, hoe men deselve noemen ofte versieren soude mogen, geen uijtgesondert, met sulcke voorwaerden, dat ick ende mijne nacomel[ingen] cameraers in der tijt van de voors. Leckendijck de voors. renthen tot aller tijt weder sullen mogen vrijen, lossen ende affcoopen tot eenemael teffens ende nijet aen parten ofte deelen mette somme van duijsent k[arolus] guldens payements voors., daer den minsten pennings affwesen sall eenen gevalueerden stuijver all voor date desen gemunt ende mits[gaders dat wy(t)leggende(?) de verschenen betaelde renthen vandien dat ick ende mijn nacomel[ingen] in de qualite als boven den inhouden van desen belijden ende acte van condemnatie daer open[baerlijck] overdoen ende laten passeren sullen voor den Hove van Utrecht ofte elders daer men elegeren sall, all tot mijn ende mijne nacoml[ingen] [. . .] terstont tot vermaeningen, ende op dat tot allen tijden blijcken mach, dat all 't gene voors. staet door resolutie ende auctorisatie als boven is geschiet, ende ten eijnde parthijen te beter verseeckert mogen sijn sal men de selve resolutie ende auctorisatie in dorso van desen doen stelen ende onderteijckenen, Sonder arch, des te enen oirconde hebbe ick Johan van Hogenhouck in de qualite end den auctorisatie als boven desen brieff met mijn eijgen hantenest(?) ende mijn segell hier neer aengehangen op den xvde maij xvi C acht ende veertich.

11

Amsterdam as the Cradle of Modern Futures and Options Trading, 1550–1650

OSCAR GELDERBLOM
AND JOOST JONKER

Trade and risk are inseparable. Consequently, from the dawn of history merchants have sought to alleviate and, if possible, eliminate the cost of risk by devising strategies to secure stability of supply and price. The simplest way to reduce risk is to spread it over various types of commodities, commercial activities, or business partners. More complicated devices for risk management include contracts for future delivery. Forward transactions imply the buying and selling for future delivery and payment. Related to this type of contract are futures—in effect, standardized forward contracts that can be sold to third parties. Perhaps the most sophisticated means to manage risk are options, which constitute the right to buy or sell in the future. Trading such derivatives allows merchants to leverage risk.

Traditionally, economic historians have equated trade in derivatives with straight bets, and condemned them as *windhandel*, that is, a purely speculative paper trade engendering no end of commercial mischief.[1] This largely negative verdict is rooted both in contemporary condemnations of speculative practices and in the classification of forward trading under Roman law as taking chances.[2] Consequently, derivatives and bets were tarred with the same brush on the basis of common features—the elements of chance and speculation—rather than distinguished by what separates them, the ability to manage risk. The revival and subsequent explosive growth of de-

rivatives trading since the 1980s has led to a marked change in appreciation. While accepting the potential dangers of ever more complex derivatives constructions, economists and central bankers alike emphasize the importance of such instruments to manage time-related risks, increasing the productivity of capital and economic flexibility, though some seasoned investors demur.[3]

Although forward contracts have been found written in cuneiform script on Mesopotamian clay tablets dating as far back as the second millennium B.C., the pedigree of modern derivatives markets appears rather shorter, running from sixteenth century Antwerp via Amsterdam to London, Chicago, and New York.[4] Amsterdam marked a singularly important phase in this evolution, for it was here that a full-fledged derivatives market of shares in the Dutch East and West India companies (VOC and WIC) first emerged, complete with standard printed contracts and set rules. In 1688, Joseph Penso de la Vega published a detailed description of this phenomenon in his justly famous *Confusion de confusiones*.[5] With the Glorious Revolution of the same year, derivative trading techniques spread to London from the Amsterdam bankers and traders who followed in William III's wake.

The subsequent evolution of derivatives trading is well documented in the work of Charles Wilson, Peter Dickson, Larry Neal, and Ranald Michie.[6] However, we still know very little about developments prior to 1688. De la Vega gave many details on the various trading techniques used by contemporaries, but provided no historical survey. During the first decades of the twentieth century, economic historians have filled at least part of this gap in the historical record. André Sayous, Willem Unger, and Johannes van Dillen explored the use of forwards and options in the grain trade in the sixteenth century.[7] Van Dillen also collected extensive evidence on speculative trading in VOC shares around 1610.[8] Likewise, Nicolaas Posthumus gathered pamphlets, placards, and notarial deeds relating to the famous "tulipmania" of the late 1630s.[9] These historians shared the negative opinion of speculation so their work, however impressive, does not amount to a balanced and judicious description of derivative trading. Moreover, several key questions still remain unanswered. To what extent did speculative trade in VOC shares modify existing practices of forward trading in grain, herring, and other bulk commodities? When did futures and options for securities and commodities become standard vehicles at the Amsterdam exchange? And, perhaps most important, how did derivative trading techniques evolve in the face of public hostility that gave rise to repeated official bans on short selling? How did traders manage to create effective rules governing contracts, clearing, and the transfer of counterparty risk?

This chapter explores why and how a full-fledged market for futures and options first developed in Amsterdam in the early seventeenth century. First we introduce forwards, futures, and options and explain what is required in theory for these derivatives to emerge. Then we trace the origins of forwards and options in commodity trade in the low countries. Next we reconstruct the brisk market for derivatives that developed after the establishment of the VOC and WIC in 1602 and 1621. Finally we analyze the contracts and clearing facilities used during the first half of the seventeenth century. An epilogue rounds off the argument.

Forwards, Futures, and Options

Before continuing we need to understand the objects under consideration. Forwards and options are contingent claims belonging to a group of financial instruments commonly

called derivatives, which derive their value from the value of another asset that varies in price. In their simplest form, forward contracts stipulate the future delivery of a fixed quantity of grain, bushels of rice, coffee beans, shares, or any other asset, for a fixed price.[10] A futures contract represents a second step in risk management. Original contractors may sell their claims to outside investors by using standardized forwards—in effect, turning these contracts into tradable assets. This process of securitization creates a futures market with opportunities for arbitrage between transactions, which narrows price differentials and offers merchants the chance to settle for the difference in price between bid and offer, rather than having to pay the full price of a transaction.

Options are more sophisticated than futures. They differ from forwards and futures in that they embody not an *obligation* but a *right* to buy (call options) or sell (put options) during a set period at an agreed price, usually a fraction of the price of the underlying asset. The rationale of options resides in their function as a form of insurance against price changes: for a small premium, traders can avail themselves of a particular market opportunity, without having to fully commit themselves or their capital. For that reason such transactions were originally called *premieaffaires* in Dutch, or *Prämiengeschäfte* in German. The association with betting so dear to economic historians in the early twentieth century is fundamentally beside the point. Options allow traders to take up market positions at a fraction of the cost, which creates endless speculative bargain opportunities. However, whereas bets require that both parties to the transaction willingly bear a particular risk, the function of options resides in the ability to *shift* risk for a small sum.

For these derivatives to emerge the underlying asset must be readily tradable, available in sufficient amounts, and subject to price changes. Price volatility creates speculative opportunities to attract investors, while liquidity and volume ensure that derivative traders can pursue their strategies at short notice and little cost.[11] This is already true for the simplest form of time bargains, forward contracts. Without a sufficiently volatile, voluminous, and liquid market for, say, coffee beans, it is unlikely that merchants will contract for the future delivery of this product. Likewise, futures and options will only be traded if there is a liquid, volatile, and voluminous market for the standardized assets underlying these contracts.

Throughout history, governments have been keen to impose restrictions on forward trading to counter price increases of staple foods or to protect small investors.[12] Moreover, for forward contracts to become futures they need to be cut loose from the original contracting parties and transformed into a standardized unit. This requires the underlying goods to be fungible, that is, in ample supply and of a standard quality allowing the substitution of one lot for any other lot. Finally, the contracts themselves must be standardized and underpinned by clear procedures to resolve transactions and to deal with disputes.

It is very useful, but not strictly necessary, for such procedures to include regular clearing arrangements and coverage of counterparty risk. Clearing, or *rescontre* as it was called in the seventeenth century, is the periodical settlement of mutual claims. Clearing creates concentrated liquidity.[13] Canceling out the claims against each other allows the settlement of transactions with payments worth but a fraction of the total portfolio. Clearing institutions may also provide cover for losses resulting from defaulting market participants. Both elements make the market more efficient, clearing by lowering the cost of settlement, counterparty cover by reducing the risk of defaults, creating a chain reaction.[14]

Antwerp and Amsterdam

Even if stock trading figured most prominently in Penso de la Vega's *Confusion de confusions*, derivatives first appeared in commodity trading. Indeed, forward trading in bulk commodities such as grain, salt, wool, and herring had already appeared in ancient and medieval times.[15] However, before the middle of the sixteenth century these transactions only involved merchants and producers trading the season's expected crop or catch.[16] Even the greatest medieval fairs, justly famous for the clearing facilities they offered to merchant bankers, never saw a regular trade in derivatives emerge. Besides the fact that very few commodities of standard quality were exchanged, the intermittent character of these fairs simply did not allow the continuous pricing necessary for derivatives trading.

New opportunities for this trade arose when the system of periodical fairs began to give way to permanent exchange in cities that combined seaborne and overland trade.[17] In the fifteenth century Venice became a city of perpetual fairs, where "trade and the clearance of payments were possible throughout the year."[18] Still, turnover continued to be highest in midwinter and early summer, when the Venetian fleets sailing to the eastern Mediterranean and northwestern Europe departed and returned, respectively.[19] A complete shift away from periodical fairs to permanent markets was first accomplished in Antwerp. Until the late fifteenth century, foreign merchants resident in Bruges or traveling from neighboring countries visited the four annual fairs of Bergen op Zoom and Antwerp to exchange their goods. However, transactions in Antwerp frequently spilled over to the time between fairs. Trade volumes rose, enabling merchants to move from the intermittent trading of consignments to transactions from stock, using descriptions supported by samples.[20] As a result, a large number of foreign merchants took up permanent residence in the Scheldt port after 1500.[21]

In 1531 a new, purpose-built exchange opened, where financial and commercial transactions between merchants were concluded, often with the help of brokers.[22] Merchants had to attend the bourse every day in order to keep abreast of the continuous price changes.[23] Following orders from the emperor Charles V, the city magistrate codified local customs, providing an explicit set of rules for contract enforcement in 1532.[24] A legislative framework in support of financial transactions was put into place in 1537 and 1539, when the emperor Charles V issued edicts validating the endorsement of bills, the bearer clause on bills and notes, and the transfer of contracts to third parties before completion.[25] Although no explicit references were made to derivatives, the rules for contracting and litigation did much to widen the scope of commercial and financial transactions.[26]

The concentration of trade in Antwerp created unprecedented speculative opportunities. Syndicates appeared on the market to manipulate prices of precious commodities, like pepper supplied by the Portuguese and copper from Hungary. Besides ordinary wagers on births and political events, foreign exchange rates also became the object of speculation—witness bans on foreign exchange options published by the Brussels government.[27] A Spanish tract of 1542 leaves little doubt about the financial acumen of those involved:

> One bets the exchange rate will be set at 2 percent (agio or disagio), the other at 3 percent, and so on. They pay each other the difference with the actual exchange rate. These kinds of bets seem to resemble the business of maritime insurance. If they are loyally pursued and fulfilled, one can hold nothing against it. However, they

> entail many despicable tricks. For this kind of business is only usual among wealthy merchants, who may draw 200,000 or 300,000 ducats in Flanders on Spain, and simultaneously make a bet thereon, leaving each other the choice which of the two agreements to honor. However, their great capital and tricks also allow them to arrange matters in such a way as to benefit from either one. This is a great sin.[28]

While Antwerp's *haute finance* speculated on the exchange rate, merchants of a lesser standing explored forward trading in grain. This development was closely linked to the rise of Amsterdam as the principal market for Baltic grain, herring, and other bulk commodities. Once the Peace of Spyer (1544) had secured a clear transit through the Danish Sound for Dutch shipmasters, merchants from Hanse towns and Antwerp started buying grain in Amsterdam.[29] By 1560 annual imports of Baltic grain amounted to as much as 3 million guilders.[30] Just like exchange rates in Antwerp, Amsterdam prices for wheat and rye were quoted every day of the year.[31] In 1556 the city confirmed the custom that prices of every transaction over half last grain (roughly 1,500 liters) had to be reported to one of the two town's bellmen. The bellmen would then proceed to present a sample of the merchandise and announce the price to other grain dealers.[32]

Between 1545 and 1570 the forward trade in grain changed from seasonal advances to producers, to regular transactions in cargoes on board ship or stored in overseas ports.[33] Besides purchases of wheat and rye that had yet to be harvested (*int groenen*, litt. still green),[34] Amsterdam saw the development of what was referred to as *stellage*, a forward contract for grain that could be annulled after a certain time had passed if the prospective buyer paid a premium to the grain's seller The practice of annulment for a fee developed into a regular transaction called *rouw koop* (litt. regretted sale).[35] There were also merchants who paid a premium in advance to secure the right to buy or sell a certain quantity of grain at a certain price after a certain period of time.[36] Such contracts for future delivery probably matured at regular intervals.[37]

Information about the various kinds of transactions has been handed down because of the upheaval they caused in years of bad harvests. In 1556, Amsterdam's sheriff Willem Baerdes accused German and Flemish merchants of "the great evil" of driving up prices through forward contracting.[38] When prices soared in the second half of 1556, Amsterdam grain dealers sought the cancellation of forward contracts concluded earlier that year.[39] Antwerp merchants protested, arguing that existing bans on forward trading did not refer to foreign grain. If the central government were to ban forwards anyway, it should at least respect existing contracts. On December 31, 1556, the Brussels government honored the latter request, declaring void only contracts "which had not been effected yet."[40] Still, rulings could not stop forward contracting, as the renewed bans on grain forwards issued in 1565 and 1571 demonstrate.[41]

Moreover, derivatives spread to markets for other bulk commodities. By the end of the sixteenth century the volume and volatility of the Dutch herring market were sufficient for regular forward trading to emerge. Total herring sales rose from less than 1 million guilders around 1550 to more than 3.5 million guilders in 1600.[42] Annual and monthly prices, collected by Posthumus for the fifteenth through the eighteenth century, leave little doubt that prices were sufficiently volatile for forward trading to emerge.[43] At the same time, the variability of catches and the considerable capital needed to equip herring busses put a premium on finding devices for risk management.[44] The only obstacle remaining was the limited fungibility of herring. However, after the Board of the Great Fisheries in 1582 and 1584 put down clear specifications for the maturity of the herring,

the time of year it was caught, and the way the fish was processed, forwards and options in the herring trade quickly followed.[45]

The precocious development of derivatives notwithstanding, contracts for future delivery did not become commodities in their own right. Neither Antwerp nor Amsterdam boasted a derivatives market in which outside investors, not involved in trading the underlying assets, traded futures or options. Perhaps the Dutch Revolt prevented the market's further evolution after 1568, but it seems more likely that the very nature of the grain trade arrested the development of derivatives trading.[46] The absence of a regular price current before 1585 meant that only insiders were able to monitor price fluctuations at the exchange, judge the value of contracts, and take up positions accordingly.[47] Moreover, the government was very keen to guard against manipulation of the trade in staple foods such as grain, fearing the social unrest which might follow price increases.[48] Repeated official bans on forward contracts stipulated that, once discovered, the seller of grain had to repay the proceeds of the forward transaction to the buyer. This created an incentive for sellers to renege on the contract once market prices rose above the price agreed upon in the contract, the very action taken by Amsterdam grain dealers in 1556 which led to the Antwerp merchants complaining in Brussels. Conversely, buyers would be tempted to do the same when prices dropped.[49] Even if this kind of regulation could not keep grain dealers from speculating, it made forwards and options investments too risky for outsiders.

The Dutch East and West India Company

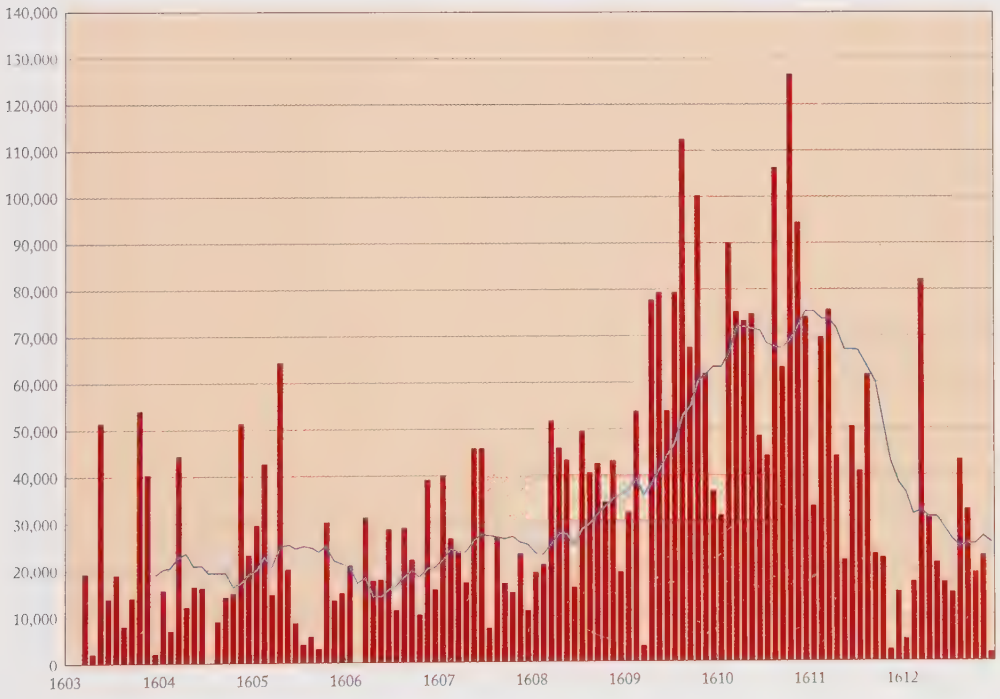
One alternative for basic foodstuffs as a vehicle for derivatives trading might have been the negotiable bonds issued by cities and states.[50] As noted in chapter 8, as early as 1262 the Venetian Republic consolidated forced loans or *prestiti* into what we now think of as bonds.[51] Similar paper claims were introduced in Genoa and Florence at about the same time.[52] These bonds—in effect, subscriptions to the registers of their respective loan offices—were regularly traded in the fourteenth and fifteenth centuries, sometimes with the help of specialized brokers.[53] Account books of foreign investors in public debt in the early fifteenth century reveal regular price fluctuations in this secondary market.[54] Still, there is little evidence for derivatives trading in Venice other than the discounting of the *paghe*, the lender's claim on interest payments, which occurred in the mid-fifteenth century.[55]

If forwards, futures, and options failed to materialize in the Venetian Republic, the most likely explanation lies in the insufficient volume of the market for bonds. This was caused by the accumulation of *prestiti* in the hands of civic and religious institutions, foreigners, and other long-term investors, in combination with the state's renunciation of new bonds issued after 1450.[56] The lack of a voluminous secondary market also prevented Dutch government bonds from becoming a vehicle for speculation before the late seventeenth century. As early as 1570 various cities in Holland and Brabant had begun to issue obligations to bearer.[57] Indeed, by 1650 these bonds constituted no less than 60 percent of public debt in the Dutch Republic. However, the bulk of the obligations remained in the hands of the political elite, trustees of estates, institutions of civil welfare, and other investors buying to hold and not to trade.[58] In the absence of suitable paper from the public sector, it was left to the private market to create an asset sufficiently liquid to set off the world's first derivatives market.

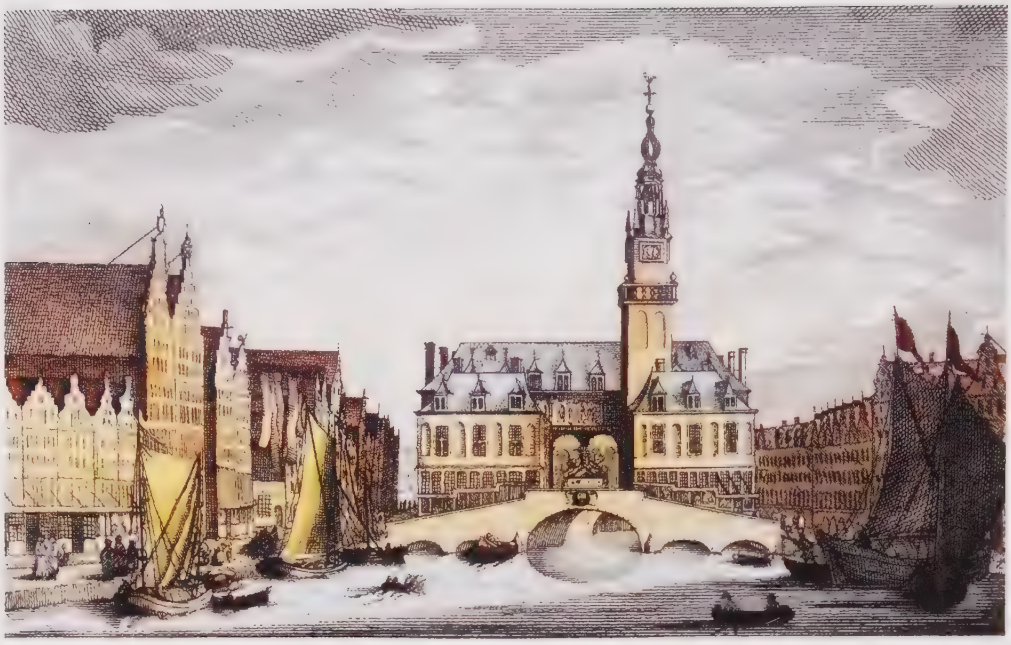
In the last decade of the sixteenth century, Amsterdam commerce entered a new phase with the launch of pioneering voyages to Asia, organized by various companies of Amsterdam merchants.[59] The merger between these companies into the VOC in 1602 re-

sulted in the creation of a joint-stock company with transferable shares. The transferability of shares, designed merely to allow participants to liquidate their investment at any given time, induced speculative trading from the very day the subscription register was closed. The fabulous returns of the first pioneering ventures, combined with the provision that payment of shares could be spread over four years, led many merchants to subscribe in the anticipation of revenues from earlier companies whose ships had not yet returned to Amsterdam. Other merchants speculated on price rises that would follow future gains of the new company. The brisk trade in VOC stock from March 1603 onward is clear from the share transfers laid down in the ledgers of the Amsterdam Chamber (see graph 11.1). In the first five years of the company's existence already a third of the capital subscribed in Amsterdam changed hands. Regular forward trade began once investors had paid up their shares in full. The prices in thirty-three notarial contracts for the future delivery of shares, concluded in the first nine months of 1607, reveal the divergent expectations of traders. Forward trading further increased in 1608 when the company's board continued to turn a deaf ear to shareholder calls for the annual reckoning and dividends promised in the VOC charter. The Antwerp merchant Isaac Le Maire organized his famous bear syndicate, selling short to raid the company stock and force the directors to change their policy and pay dividends. At the same time dozens of other merchants began to speculate on their own account.[60] Again, a series of seventy-five notarial contracts, running from October 1608 through April 1610, shows the variety of prices agreed upon for the future delivery of shares (see graph 11.2).

GRAPH 11.1. MONTHLY TRANSFERS OF SHARES OF THE AMSTERDAM CHAMBER OF THE VOC

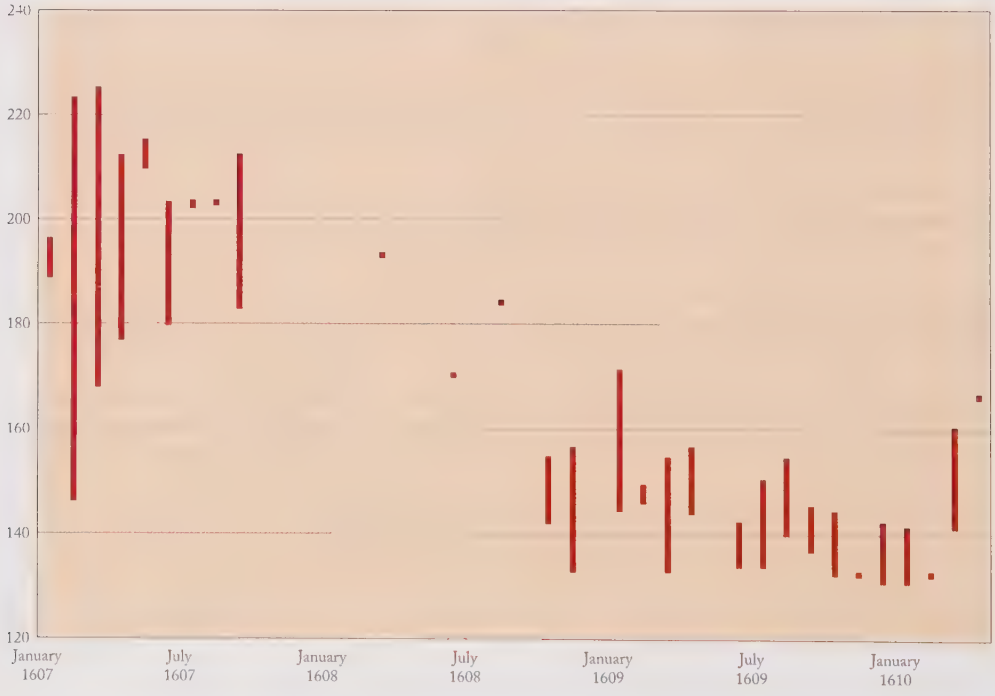


Calculated as a percentage of the total stock of capital, 1603–1612 (with six months' moving average).
Source: Gelderblom and Jonker, "Completing a Financial Revolution."



Amsterdam exchange, Rokin side. 1611. Modeled on the London Royal Exchange, this building consisted of an open courtyard surrounded by a colonnaded archway to provide shelter against the weather. Shops lined the two entries, some of them selling stationery such as printed forms and contracts.

GRAPH 11.2. HIGHEST AND LOWEST MONTHLY PRICES OF CONTRACTS FOR FUTURE DELIVERY OF VOC SHARES. JANUARY 1607–APRIL 1610.



Source: ACA Card Index Notarial Archives.

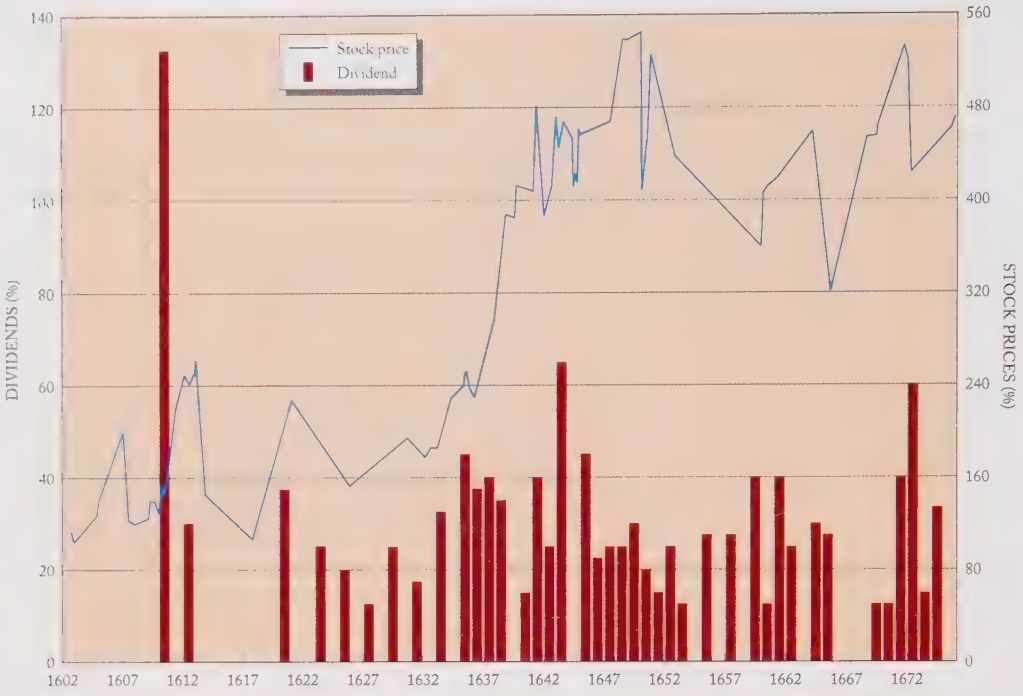
Admittedly, the sample is a small one but a clear trend emerges. The much lower prices of 1609 and 1610 bear out the speculation *à la baisse* undertaken by Isaac Le Maire and others, while the clear narrowing of price differences toward the end of the period shows an increasingly effective arbitrage at work.[61] The consequences of Le Maire's bear raid were mixed. The syndicate failed to force down the long-term share price. As a result, several traders went bankrupt when they had to buy shares at prices much higher than the ones stipulated in the contracts for delivery they had to fulfill in 1610. On the other hand, the bear raid did have the beneficial effect of forcing the VOC board to pay dividends to its shareholders, a decision that added considerably to the attractiveness of company shares to investors. Finally, the market as a whole underwent a rapid transition in two respects. First, keen trading paved the way for standardization of forward contracts and the appearance of futures. Several documents issuing from the Lemaire syndicate show traders dealing in contracts between third parties, sometimes even in batches.[62] Second, though the government responded to intense lobbying by the VOC board by issuing a ban on short selling in February 1610, the authorities do not appear to have enforced the rule with any great vigor.[63] Perhaps the ban was meant as no more than a sop to the VOC, but peer pressure also seems to have knitted the share traders together sufficiently to prevent renegers from invoking the ban in order to get out of a contract.[64] Whatever the cause, despite the official bans on short selling, repeated in 1621, 1623, 1624, 1630, and 1636, a climate of permissive regulation existed which allowed the market to flourish.[65]

Forward trading derived a new, powerful impetus from the creation of the West India Company (WIC) in 1621.[66] This company not only received a monopoly on the triangular trade between the Republic, West Africa, and Latin America, but it was also entrusted with the impossible task of conquering and colonizing the Spanish and Portuguese colonies in Latin America. Investors proved deeply skeptical about this twin concept. It took two years before sufficient capital was raised to equip the first ships. Stock prices moved around par until the accidental capture of Spanish ships laden with silver in 1628. Prices soared to more than 200 percent of par in January 1629 but the momentum was quickly lost.[67] Before the end of the year the WIC had become a prime target for bear speculators, with forward prices dropping from 235 in March 1629 to 150 in 1630, and less than 80 in 1633.[68] The year 1646 witnessed the operations of a bear syndicate against the WIC in the Le Maire mold.[69]

Regular forward trading notwithstanding, there are no pamphlets, protests, contracts, or any other documents demonstrating the use of stock options in early seventeenth century Amsterdam. This is somewhat surprising, for in theory it is but a small step from forwards and futures to options trading. Indeed, Amsterdam grain dealers had used both forwards and options in the 1550s and 1560s. One might of course argue that no traces are left because none of the deals went sour. However, it seems more likely that few options were concluded for lack of short-term price fluctuations. The protocols of Amsterdam notaries reveal that the earliest forward transactions mostly had terms of one to three years, suggesting that merchants carefully shifted positions with long-term strategies, rather than trade in reaction to price changes. This strategy changed only in the 1630s when contracts for delivery within six months became common practice.[70]

A change in the dividend policy of the VOC and the effect this had on share prices appear to have been the twin causes for the profound shift in trading practices. During the first two decades of the company's existence, shareholders only received dividends in 1610, 1612, and 1620. In the third decade VOC shareholders were paid dividends five times. It was as late as 1635 that the company began to distribute dividends every year.

GRAPH 11.3. ANNUAL DIVIDEND PAYMENTS AND MONTHLY SHARE PRICES OF THE VOC (1602-1675).



Sources: The price of VOC shares from 1602 to 1675 is based on some 150 price quotations, collected from the Amsterdam City Archives, Notarial Archives Card Index; Van Dillen, "Isaac le Maire," 15, 21, 22; and Van Dillen, "Effectenkoersen," 10–11. Linear interpolation was used to calculate prices for months for which no price data is available. Cumulative annual dividends are calculated from De Korte, Financiële, 68–71, appendices 1a, 1b, 1c, 1d.

Annual payouts averaged 10–20 percent, but varied from year to year with the company's performance, with lows of 15 percent and peaks of 65 percent, giving punters many opportunities for speculation.

The company's dividend policy had a profound impact on the stock market. A reconstruction of share prices from 1602 to 1675, based on quotations found in the Amsterdam notarial records, shows that prices became much more volatile with weekly, sometimes even daily, price fluctuations during the few months for which we have more than one quote.[71] Moreover, the price rose sharply (see graph 11.3). VOC shares traded in a range of 120–240 percent until the mid-1630s, when they began a steep ascent, touching 400 in 1638, 480 in 1643, and peaking at 540 in 1650. In the following years prices continued to move between 400 and 550, with marked troughs only in October 1659 and in July 1665. This rise put an effective premium on derivatives trading. By 1640 cash transactions in VOC shares were beyond the reach of all but the wealthiest merchants—a standard deal of 500 pounds Flemish now no longer cost 3,000–6,000 guilders, but 12,000–16,500 guilders.

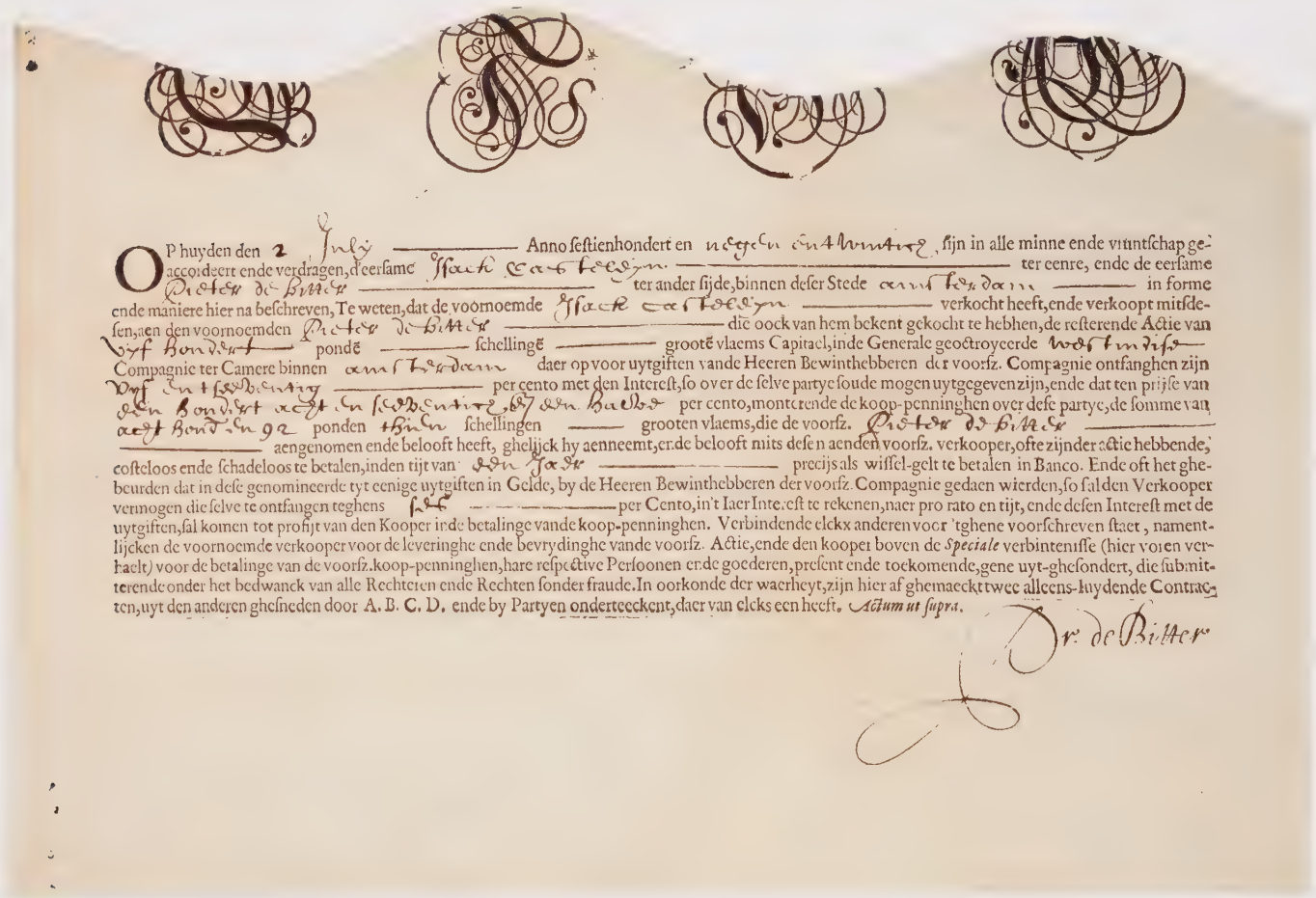
Together, the lure of dividends and high share prices boosted trade and stimulated innovation. In 1642, members of the sworn brokers' guild complained to the authorities about several clandestine brokers or *beunhazen* mediating in the sale of forward contracts.[72] Five years later, the official tariffs for brokers were lowered because "every day more and greater lots of shares [were] traded."[73] As for innovation, in 1639 one finds the first reference to the *prolongatie* of forward contracts, which allowed merchants to roll

over a contract on expiry in the hope of gaining from further price changes in the future.[74] A 1642 pamphlet excoriated traders who tried to manipulate prices with techniques very similar to the ones that had been used by the first bear syndicate in 1608.[75] In addition, the anonymous writer reviled the use of *beleening* or borrowing of shares, that is, the trade with shares one did not legally possess. This construction, bracketed together with option contracts in 1689, allowed traders to benefit from price fluctuations without tying up their capital.[76] It must have been a popular technique, since the brokers' ordinance of 1647 explicitly forbade brokers to lend shares to customers.[77] We may also tentatively date the emergence of ducaton shares, really a trading convention to deal in 50 pounds Flemish rather than 500, to the 1640s or perhaps the 1650s. Other changes in market conditions included the switch from quarterly to monthly settlement and the regular prolongation of contracts to the next day of settlement.[78]

Contracts and Clearing

By 1650 Amsterdam had clearly moved beyond the earlier achievements of Venice, Genoa, and Antwerp. The speculative boom generated by the VOC and WIC worked as

Printed forward contract for a share in the Dutch West India Company worth 500 pounds Flemish at 178.5 percent (1629), to be settled in a year's time. Standard forward contracts became common around 1610, but this is the first known printed specimen. The buyer did not fulfill his obligation, so the contract ended up in the notarial records when the seller tried to get compensation.



OP huyden den 2 Julij Anno ſeſtienhondert en negen en twintich, ſijn in alle minne ende vrintſchap geaccordeert ende verdragen, d'eerſame Isack Casteleyn ter eenre, ende de eerſame Pieter de Bitter ter ander ſijde, binnen deſer Stede Amsterdam in forme ende maniere hier na beſchreven, Te weten, dat de voornoemde Isack Casteleyn verkocht heeft, ende verkoopt mitſdeſen, aen den voornoemden Pieter de Bitter die oock van hem bekent gekocht te hebben, de reſterende Actie van vijf hondert pondē ſchellingē grootē vlaems Capitael, inde Generale geoctroyeerde West Indiſe Compagnie ter Camere binnen Amsterdam daer op voor uytgiften vande Heeren Bewinthebberen der voorſz. Compagnie ontfanghen zijn vijf en tſeeventig per cento met den Intereſt, ſo over de ſelve partye ſoude mogen uytgegeven zijn, ende dat ten prijſe van een hondert acht en ſeeventich, en een halve per cento, monterende de koop-penninghen over deſe partye, de ſomme van acht hondert en 92 ponden thien ſchellingen grooten vlaems, die de voorſz. Pieter de Bitter aengenomen ende belooft heeft, ghelijck hy aenneemt, ende belooft mits deſen aenden voorſz. verkooper, ofte zijnder actie hebbende, coſteloos ende ſchadeloos te betalen, inden tijt van een Jaer precijs als wiſſel-gelt te betalen in Banco. Ende oft het ghebeurden dat in deſe genomineerde tyt eenige uytgiften in Gelde, by de Heeren Bewinthebberen der voorſz. Compagnie gedaen wierden, ſo ſal den Verkooper vermogen die ſelve te ontfangen teghens ſes per Cento, in't Iaer Intereſt te rekenen, naer pro rato en tijt, ende deſen Intereſt met de uytgiften, ſal komen tot profijt van den Kooper inde betalinge vande koop-penninghen. Verbindende elckx anderen voor 'tghene voorſchreven ſtaet, namentlijcken de voornoemde verkooper voor de leveringhe ende bevrydinghe vande voorſz. Actie, ende den kooper boven de *Speciale* verbinteniſſe (hier voren verhaelt) voor de betalinge van de voorſz. koop-penninghen, hare reſpective Perſoonen ende goederen, preſent ende toekomende, gene uyt-gheſondert, die ſubmitterende onder het bedwanck van alle Rechteren ende Rechten ſonder fraude. In oorkonde der waerheyt, zijn hier af ghemaeckt twee alleens-luydende Contracten, uyt den anderen gheſneden door A. B. C. D. ende by Partyen onderteeckent, daer van elcks een heeft. *Actum ut ſupra.*

Dr. de Bitter

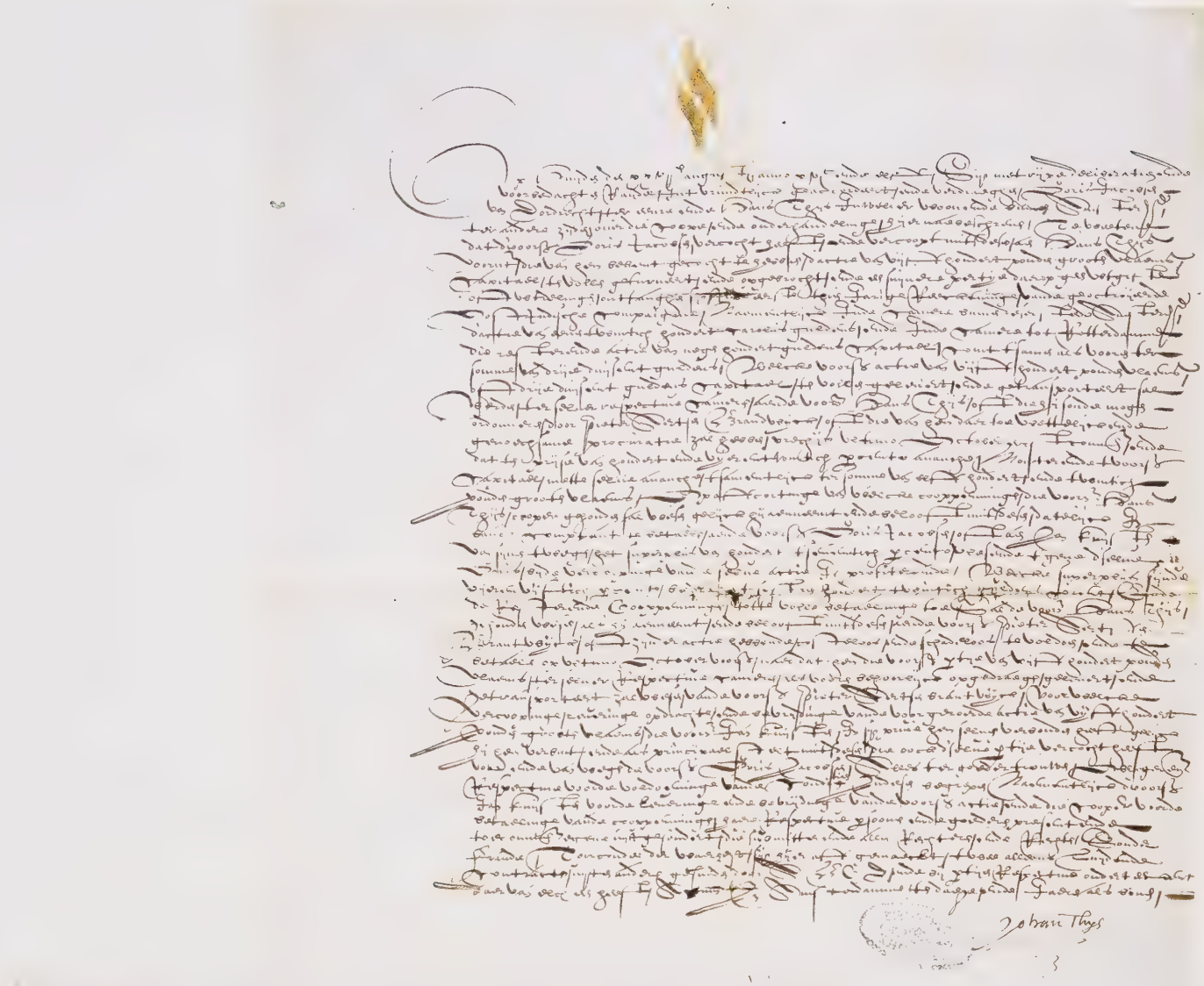
a hothouse for the city's financial market. A host of new financial techniques, including the pledging of shares as loan collateral, *repo* transactions, forwards, and futures became common property.[79] Unfortunately there is very little evidence to document the daily practice of these financial operations. As with other commodities, merchants mostly used private contracts for the buying and selling of shares, credit operations, and derivatives trading. Once a transaction was completed and written up in the business ledgers, merchants simply tore up the original contracts. The few contracts that still exist relate without exception to transactions that were not, or not properly, completed.

One such transaction involves the untimely death of Hans Thijs, an Amsterdam merchant who was killed in a shipping accident in September 1611. His business papers and the ledgers of the VOC show this merchant bought and sold more than twenty shares in various chambers of the company without ever passing before a notary.[80] Among the unsettled contracts in his estate are a handwritten forward, signed only weeks before his death, and a handwritten future from December 1610, stipulating the transfer to a third party of a forward contract negotiated the year before.[81] These documents make it clear that the emergence of neither forwards nor futures hinged on the availability of standardized, printed contracts.[82] To certify the transaction it sufficed that "two duplicate contracts were made, cut in half through ABCD and signed by both parties respectively."[83]

The first reference to printed contracts is found in a notarial deed written after the failure of Amsterdam's first bear syndicate in the spring of 1610. The bankruptcy of the bookkeeper and various members of the syndicate led to a host of declarations regarding contracts that had not been fulfilled. Most of these deeds refer to notarized or private contracts, but in one attestation a merchant from Dordrecht mentioned "forty pieces of printed contracts for shares." Perhaps to save the trouble of traveling to Amsterdam, he had left them in the hands of the syndicate's bookkeeper in 1609.[84] For a time, private handwritten and notarized contracts appear to have circulated alongside each other, but printed forms presumably predominated by 1620.[85] Thus the survival of what today are the world's oldest printed forward contracts was a matter of chance.[86] In 1635, the heirs of a merchant who had written two forwards in 1629 appeared before a notary to try and force the reluctant other party, a merchant who in the meantime had moved to Maastricht, to accept a settlement. As proof of the transaction, the two printed forms were attached to the notarial deed.

Besides written proof of their transactions, traders had to make arrangements for the payment of their contracts.[87] The dearth of cash and the hassle of repeated bank transfers put a premium on devices to cancel out transactions against each other. At first, individual merchants privately arranged the settlement of mutual claims.[88] The regular clearing of accounts occurred in Amsterdam's cattle trade as early as 1502. In that year the town magistrate appointed a *registermeester* to organize the public sales of oxen. The *registermeester* administered all sales, received payments from buyers, advanced money to sellers, and at the end of each day settled the accounts.[89] To be sure, similar *veetafels* had already been established in Antwerp, Lier, and various German cities in the second half of the fifteenth century. In all likelihood, it was the perennial scarcity of coin, which made it difficult for traders to pay for cattle in cash, that spurred on this financial innovation.[90]

Sometimes groups of merchants organized clearing together. For example, shortly before Le Maire's bear syndicate was dissolved in 1610, the members agreed to stop buying and selling and "merely settle the lots to be delivered with the lots to be received."[91] Such private arrangements of course only covered the transactions of a specific group, not of the market as a whole.



Above: *Handwritten contract for the future delivery of two shares in the Dutch East India Company worth 500 pounds Flemish. 1611.* In the early years of the company's existence merchants typically used private or notarized contracts to conclude forward transactions.

Below: *Handwritten future stipulating the transfer of a forward contract. 1610.* A handwritten future stipulating the transfer of a forward contract concluded the year before. Futures emerged in Amsterdam before forward contracts were printed. For merchants it sufficed to describe the forward traded in one of two duplicate contracts.

This latter function appears to have been performed by the *makelaars* or sworn brokers, appointed by the city council and under oath to act as impartial intermediaries between buyers and sellers. Brokers occupied a pivotal position in Amsterdam trade. Though merchants were under no legal constraint to use brokers, most of them did, which explains the rapidly rising number of *makelaars* to 300 in 1612.[92] The brokers' charter included an official obligation to keep a register of all the transactions arranged, and the brokers' data served both as raw material for the official commodity price current, and as proof for the price of particular goods on the market at a specific time.[93] These ledgers enabled them to organize an effective clearing at regular intervals. We know for certain that they did so during the second half of the seventeenth century, and a formal contract with detailed clauses for arranging options contracts survives for 1739.[94] Earlier evidence for brokers organizing a clearance of share transactions and derivatives remains scanty, but they do appear to have been as central in the share trade as in any other branch. As early as 1610 they informed merchants inside and outside the city about market conditions and wrote their contracts for immediate or future delivery. If necessary, brokers registered transfers of shares in the offices of the VOC.[95] In 1613 the city council recognized this intermediate role and introduced a brokerage of 0.5 percent for share transactions.[96] At the same time, the brokers' guild admitted stockbrokers as members, including the former bookkeeper of Le Maire's syndicate.[97] Once involved in the buying and selling of shares, it was only a small step for brokers to provide clearing facilities. Indeed, a short note kept with a forward contract signed by Hans Thijs in 1611 specified the arrangement his broker had made for its payment.[98]

Whether the services offered by brokers at this stage included the coverage of counterparty risk remains unknown. Merchants must have been familiar with various means to hedge risks. In fifteenth-century Venice, traders in bills of exchange made sure to receive a collateral or personal bond to cover for counterparty risk.[99] In the sixteenth century Antwerp merchants took out insurance to cover the risk involved in bottomry loans, which were only repaid upon a ship's safe arrival.[100] These and other techniques to minimize the counterparty risk must have spread to Amsterdam, but unfortunately we cannot tell whether stock traders used them. But even if they did not, repeat dealings and peer pressure may have sufficed to induce merchants to honor their obligations.[101]

Although evidence for self-regulation of forward and futures trading in shares appears

Opposite: *Option Keyserlijcke Indische Compagnie. 1730.* By the 1720s, derivatives trading in shares had spread from Amsterdam and London to Antwerp. In 1727 the charter of the Generaele Keyserlijcke Indische Compagnie, a company for the Asian trade based in Ostend, was suspended for political reasons, creating a surge of speculation about its future accompanied by options trading.

The contract has all features of modern-day stock options. It reads (in Dutch): "I undersigned Pierre Cle promise and obligate myself for a Cash premium, which has been received to my satisfaction, to deliver and transfer at sight of this (contract), to Mr Joan van Lancker or his order, between today and the first transfer day after next August first, six shares in the Generaele Keyserlycke Indische Compagnie, under condition of reimbursing me upon transfer everything that has already been, and perhaps may have been paid toward these shares during that period, and in addition paying me at the same time the sum of seven hundred pounds cash for the second premium at the rate of seventy percent agio on every share, and will in return to whom who will accept and pay these shares at the same time pay out and reimburse, everything that the Company in the meantime will in any form return on these shares as dividend, reimburse, or give, even if this would exceed the aforementioned payment, but if these shares have not been called from me by next August first, and on the first transfer day after the call have not been transferred and paid, to which the caller is obligated, then this obligation on my behalf will have no value, and the shares like the cash premium, which will always and irrevocably belong to me, with everything that will be received from the company will be abandoned to me.

Hereby contracted through intervention of Mr Van der Hoeke, sworn broker, under contract of my Person and goods in Antwerp the tenth of November seventeen twenty nine. "

Pierre Cle (signature)

For 6 Shares at 70 P.C. in option to request during the period until the first of August 1730, one day before the transfer.

Dit Contract wort verkocht t'Antwerpen bij Alexander Everaerts
woonende op de Minder-Broeders-Ruij, in S. Ignatius.

Visé 12 April 1730. &
geenregistreert f° 16.
philip Jacob de Coninck

N° 103.
6 Aug. 30

Ick onderschreve Pierre Clé ——— belove en obligere mij mits een Contante premie, die tot mijn Contentement ontfangen hebbe aen [illegible] Joan van Lancker oft sijne ordre, op het vertoon deser tusschen heden en den eersten transportdagh naer den eersten augusti naestcom.e te leveren en te transporteren sesse Actien in de Generaele Keijserlijcke Indische Compagnie alhier onder conditien, van aen mij beneffens het transport te rembourseren alle het gene nu reets is, en misschien noch op die Actien in die tusschen tijdt sal gefourniert worden, en boven dien noch te-gelijck aen mij te betaelen andere somma van seven hondert ponden wissel [illegible] voor tweede premie à rato t' seventigh par Cento Agio op ider Actie, sullende daer tegens aen den gene die dese Actien als boven sal aen-veirden, ende betaelen, ter selver tijde uijtkeeren ende vergoeden, alles wat de Compagnie in die tusschen tijdt op die Actien eeniger wijse sal divideren, rembourseren ofte geven, al beliep sulckx meer als sijn bovenschrevene te doene naer betalinge, maer den eersten augusti naest commende voorseijt, dese Actien aen mij niet op-gevraeght sijnde, en op den eersten transportdagh naer de op-vraginge niet getransporteert ende betaelt sijnde, waer toe den opvraeger gehouden is dan blijft dese obligatie ten mijnen laste Nulle en van geender waerde meer sijnde dan die Actien gelijck oock den contanten premie die mij voor nu voor altoos onbrekelijck en onweder-roepelijck toe-behoort, met alles wat van de Compagnie sal ontfangen worden aen mij geabandoneert. Aldus gecontracteert ter interventie van monsieur van den hoecke gesworen [illegible] ———

onder verbintenisse van mijn Persoon en goederen in Antwerpen den [illegible] seventhien hondert [illegible] negen en twintigh.

[illegible]

voor 6 Actien a 70 P. C. in optie tot prima augusti 1730 inden tusschen tijdt een dagh ——— voor't transport op te vraegen

scant before 1650, we do possess a well-documented example of just such a system emerging in the commodity sector, namely, tulips.[102] Before the tulipmania gripped the Dutch countryside in 1636 and 1637, the tulip market was a seasonal trade in specific bulbs that were seen in the field in early spring and then sold for delivery after they had been lifted from the soil in early summer. As demand pushed up prices, futures and options began to replace forwards. By 1635, trade had changed from seasonal transactions in particular bulbs to year-round futures dealings in lots assorted by variety and by weight. To organize the market, bulb growers started trading clubs run by a board and administered by a bookkeeper.[103] These inn-based trading clubs are usually portrayed as the paradigm of speculative excess, dens of iniquity in which professional traders lured hapless punters to speculate beyond their means with free wine and tall stories of gain.[104]

However, there's a sober truth behind the vivid scenes of drunken dealings in thick tobacco smoke.[105] The sessions were soundly organized to prevent any trouble arising from dodgy deals. On entering the inn, customers wishing to participate had to introduce themselves to the bookkeeper, who then gave them a slate with their name written on it for the bidding. The bookkeeper also tracked all transactions in a ledger for settlement through clearance at the end of the evening. Trade centered on what the Germans call *Differenzgeschäfte*, the settlement of payments by canceling out mutual claims. A small charge was levied on sales to cover expenses. The market for ducaton shares in the VOC which had emerged by 1650 used an identical organization, with an appointed bookkeeper tracking and clearing transactions, with the participants settling the price differences.[106]

The tulip trading clubs proved very effective in smoothing transactions. Nearly all notarial deeds contesting deals gone sour document transactions done *outside* a club, and thus not subjected to monitoring boards.[107] One may therefore conclude that the clubs acted as the moderators of speculation, and not as drivers. The aftermath of the tulipmania demonstrates just how widely the fundamentals of derivatives trading had spread. The Court of Holland refused to hear litigation cases issuing from tulip sales, judging them to be bets under Roman law.[108] It was left to individual city councils to clear up the confusion surrounding deals collapsed after the bubble had burst in February 1636. The official adjustments by local authorities tarred all tulip transactions still to be completed with the same brush, transforming them into options. Buyers were put in the position of a *rouw koop*, that is, they were no longer obliged to complete, but received a call right in return for a premium varying from 3.5 to 10 percent, depending on the city.[109] This transformation demonstrates first of all that by the late 1630s, city councils were sufficiently familiar with derivatives trading both to understand the core of the problem and to devise an imaginative solution. In addition, private and more or less informal arrangements sufficed to provide derivatives trading in commodities with a sound infrastructure to reduce the risk of bad deals and noncompliance. In the absence of firm documentary evidence, we can only surmise the arrangements in the tulip trade to have been copied from the Amsterdam securities market, where brokers presumably pioneered them during the first quarter of the seventeenth century.

Epilogue

Thus by the 1680s, when Joseph de la Vega wrote his book, the Amsterdam derivatives market had already come a long way indeed, from grain options in the 1560s to a panoply of techniques revolving around the trade in VOC and WIC shares. Public opinion had

also matured considerably. Opponents of speculation no longer pleaded for outright bans on derivatives, but for control through selective taxation. After a prolonged debate, the Amsterdam city council introduced a stamp duty on all share transactions in 1689, tied to new and lower brokerage fees with the first specific tariff for options on VOC and WIC shares. An attempt to clamp down on options failed, presumably because this only served to boost the business of *beunhazen* to the detriment of the sworn brokers.[110] The sanctions were weak, anyway; after all, since 1610 traders had defeated repeated threats of contracts being declared void by ensuring compliance through peer pressure. At present it is simply unknown to what extent traders complied with the new regulations and began to use the new stamped forms adorned with the city seal, for no contracts of share transactions or derivatives appear to have survived at all.[111]

Consequently, the financiers following William III to Britain possessed a full range of financial techniques, and for which they found a ready market indeed. This transfer of know-how formed the basis of derivatives trading in London, firmly linking Amsterdam's pioneering work to the emergence of modern markets.

12
Annuities in Early Modern Europe

JAMES M. POTERBA

The private annuity market in the United States today is small. While there are substantially larger markets in other nations, notably the United Kingdom, most economics research on the annuity market focuses on explaining why so few households choose to purchase life annuities. New investigations of annuity pricing are rare, and they focus on the appropriate actuarial models for life expectancy of the annuitant population.

The situation could hardly have been more different three centuries ago. Annuity contracts were one of the most popular financial instruments issued by governments with a need to finance wars, public works, and other projects. New annuity products with innovative features were frequently introduced, and international syndicates of investors sought to purchase the most favorable government annuities in an active international market. These investors devoted substantial resources to identifying long-lived individuals and enrolling them as nominees for annuity contracts. The conceptual problem of how to set the price of an annuity contract was unresolved, and it attracted some of the greatest scientific and mathematical minds of the sixteenth and seventeenth centuries, including Edmund Halley, Abraham de Moivre, and Nicholas Bernoulli.[1] When the earliest statisticians produced detailed tables on births, deaths, and mortality rates, this information was promptly used to value annuity contracts.

This chapter provides a brief introduction to annuity markets in early modern Europe. It focuses on the interplay between research in financial economics, actuarial science, statistics, and applied probability theory in advancing the understanding of annuity-type contracts and their pricing. It draws heavily on the excellent summaries of this market by George Alter, James C. Riley, and Geoffrey Poitras.[2] The chapter is divided into five sections. The first describes the role of annuity-type life interest contracts in ancient Rome and the need to develop simple mortality tables ("life tables") to price certain contracts. It tracks the evolution of the annuity market through the Middle Ages. Section two focuses on government-issued annuity contracts in the sixteenth and seventeenth centuries, particularly in Holland and England, and emphasizes the evolution from annuities that were sold at a fixed price, regardless of the age of the nominee, to age-contingent annuity pricing. The third section presents evidence of the role of adverse selection in the annuity markets in Holland, France, and England. It includes a brief discussion of tontines, a particular type of annuity that was popular in France during the eighteenth century. The fourth section describes the role of annuity-type products as an early vehicle for providing for financial security in old age and discusses their issue by friendly societies and early mutual insurance arrangements. Finally, there is a brief conclusion that notes the relationship between government sale of annuities to raise revenue and early proposals for government-sponsored annuities as a way to provide old income support. These proposals were forerunners of modern Social Security systems.

Annuities in Classical Rome and the Middle Ages

Annuity contracts take many forms. All annuities provide buyers with periodic payments for an agreed-upon span of time. While some financial instruments that offer payouts for a certain number of years (and are therefore equivalent to bonds) are called annuities, the usual meaning of "annuity" is a contract that offers payouts for the duration of someone's life. The individual on whose life the payouts are conditioned is the "nominee." In some cases, such as joint and survivor annuities that make payments as long as either member of a married couple is alive, there may be multiple nominees. Today, the nominee is usually the person who receives the annuity payouts, but in principle the beneficiary and the nominee could be different individuals.

Annuities are investments, so they compete against other financial products on rate of return and other features, but they also offer individuals insurance against the risk of outliving their resources. Annuities are sometimes referred to as "reverse life insurance." A life insurance policyholder pays the insurer each year until he or she dies, after which the insurance company pays a lump sum to the insured's beneficiaries. An annuity buyer, in contrast, makes a lump-sum payment to the policy issuer when the annuity begins, and then receives regular payouts until the time of death.

An insurance company or a government that sells annuities can pool mortality risk across similar individuals, and it can use the undistributed principal left behind by those who died sooner than expected to offer more generous payouts to those who live unexpectedly long. Because surviving annuitants receive not just the return on their initial premium but also the return and even the principal of those annuitants who predeceased them, annuity sellers can promise a rate of return that exceeds the return on comparably risky financial instruments that do not offer life-contingent payouts.

There were active insurance markets in ancient Rome. The risks of sea voyages were frequently insured, and the market for maritime insurance was well developed. There

were also a number of financial products that promised life-contingent payouts. Marquis James reports that ancient Roman contracts known as *annua* promised an individual a stream of payments for a fixed term, or possibly for life, in return for an up-front payment.[3] These contracts were apparently sold by the same speculators who dealt in marine and other lines of insurance.

Insurers must have had rules for pricing *annua*, but they do not seem to have been preserved for financial historians. An early recorded attempt to value life-contingent payout streams comes from the Roman courts, rather than from private insurance markets. Roman law specified that the primary beneficiary of an estate, typically the oldest son, was entitled to at least one-quarter of the estate's value. In some cases, a decedent might leave life interests to various other beneficiaries, such as other children. The difficulty with such life interests was that they might cumulatively absorb so much of the estate that the primary beneficiary would no longer receive one-quarter of the decedent's assets.

To determine the value of life interests, and thereby evaluate the one-quarter interest test, Domitius Ulpianus, a Roman jurist, investigated mortality patterns at various ages. He compiled a table for the valuation of life interests. This table (see table 12.1) indicates the multiple of the annual payout that should be used for annuity valuation, and it is usually interpreted as a table of life expectancies. This assumes that Ulpianus did not recognize the time value of money, but rather multiplied the current annual payout by the expected number of years that the payout would be received to determine its value. On this assumption, it makes sense to compare the entries in Ulpianus's table with estimates of age-specific life expectancy made at later dates.

There is another possible interpretation of the Ulpianus table, namely, that it showed valuation multiples that in some way included an interest rate component. In this case, the common interpretation of the table as showing life expectancies at different ages would be erroneous, and actual life expectancies would be greater than the values shown in the table. Without other data on annuity valuation or mortality rates, it is not possible to resolve the difference between these views.

Annuity contracts were traded throughout the Middle Ages, particularly in countries where church-imposed usury laws were actively enforced. When borrowers were not allowed to pay more than a legally established interest rate on loans but credit market equilibrium dictated a higher rate, annuities provided one way to circumvent the usury laws. Annuities involved some risk, so they were not simple loan contracts; this enabled them to escape coverage by usury ceilings.

Ray D. Murphy reports that monasteries and churches were among the institutions that sold annuities. He cites the example of an annuity sold in 1308 by the Abbot of St. Denis to the Archbishop of Bremen for 2,400 livres. The annuity paid 400 livres per year and was apparently contested by

TABLE 12.1.
"LIFE EXPECTANCY" AS COMPUTED BY DOMITIUS ULPIANUS

Age of Life Interest Holder	Life Expectancy
0–19	30
20–24	28
25–29	25
30–34	22
35–39	20
40	19
45	14
49	10
50–54	9
55–59	7
60 +	5

Source: Anders Hald, *A History of Probability and Statistics and Their Application Before 1750* (New York: John Wiley and Sons, 1990), 117.

the abbot in 1323, four years before the archbishop died, on the grounds that it was usurious. Annuities were typically priced in terms of "years' purchase," the ratio of the premium divided by the annual payout. The archbishop, for example, bought his annuity for six years' purchase.[4]

Murphy also reports that Italian city-states were borrowing through annuity-like contracts by the twelfth century.[5] James D. Tracy claims that by 1260, towns in northern France such as Douai and Calais were issuing *rentes vagieres*, or life annuities, as well as *rentes heritables*, or consols, to raise funds.[6] The city of Ghent, in Flanders, issued *lijfrenten*, or life annuity contracts, beginning sometime between 1275 and 1290. The practice of issuing long-term government obligations continued to diffuse northward and was adopted shortly afterward by cities in present-day Holland and Germany.

Government annuities during this period were subject to default risk. For example, Tracy reports that by the 1330s, the *lijfrenten* that had been issued by the city of Ghent were nearly worthless, as the city could not find revenue sources to meet ongoing payment needs. In 1494, Archduke Philip the Handsome, then Count of Holland, permitted all Dutch cities to suspend their *lijfrenten* payments for a year, relieving widespread city fiscal disarray. In spite of the sovereign default risk associated with these products, there was substantial demand for *renten*. By 1535, Amsterdam had committed 60 percent of its annual revenues to interest and annuity payments.[7] The comparable statistics for other cities were similar: 58 percent in Gouda, 55 percent in Haarlem, and over 60 percent in Leiden.

Lorraine J. Daston reports that in the early fifteenth century, the city of Amsterdam routinely sold annuities at 8.5 years purchase for single annuities and 11 years purchase for joint annuities.[8] These prices correspond to an annual payment equal to 11.76 percent of the purchase price for single annuities, and 9.09 percent for joint annuities. Heritable annuities sold for 16 times the promised interest payment at roughly the same time.[9] This was substantially lower than the rate of return that governments were required to pay when they borrowed money in the form of short-term loans, and the yield spread between the *renten* and loans accounted for the growth of *renten* as a means of finance. Annuity prices apparently varied across cities and over time, reflecting both variation in the perceived credit-worthiness of the government selling the annuity, and movements in the overall level of interest rates. However, annuities were rarely traded in a secondary market, and the wide variation in selling prices suggests that this market may have exhibited important inefficiencies.

The Rise of Age-Related Annuity Pricing

National governments followed cities and municipalities into the practice of issuing life annuities. Murphy claims that the first annuity issue by a *national* government took place in the Dutch Republic in 1554, when 100,000 guilders was raised for a war with France.[10] These annuities were sold at six years' purchase, regardless of the age of the nominee on whose behalf the annuity was subscribed. The high implicit return on these issues may reflect the risk of Holland's defeat in this war. England first used annuities for national government finance in 1692, in this case to raise one million pounds, also for a war with France. Once again, the annuities were sold without respect to the age or sex of the nominees. The primary reason that governments sold annuities at age-independent prices until the late 1600s was that neither buyers nor sellers had an accepted algorithm for valuing the annuity payouts at a given age.

JAN DE WITT AND AGE-GRADED ANNUITY PRICING IN HOLLAND

The first steps toward selling age-contingent annuities were taken in Holland during the latter part of the seventeenth century, through the efforts of a political leader with substantial training in mathematics, Jan de Witt. De Witt became prime minister of Holland in 1653. During his tenure as prime minister, Holland was at war with England (1665–1667) and there were ongoing hostilities with France that eventually resulted in a French invasion. Raising funds to finance the military, by means of life annuities, was an active part of his fiscal program.

De Witt was unsatisfied with the practice of selling life annuities at a constant price regardless of the nominee's age. In 1671, de Witt published *Value of Life Annuities in Proportion to Redeemable Annuities*, which presented analytical results on the comparative valuation of life annuities and "redeemable annuities," which were effectively redeemable consols.[11] Redeemable annuities promised a given annual payout and also allowed the buyer the option of redeeming the annuity, at any time, at its purchase price. If a redeemable annuity promised a payout of a per year and sold for a price P, then it would be possible to derive a sequence of valuation rules, corresponding to different redemption dates. If the annuity was expected to be redeemed after receiving the second annuity payment, for example, and if each payment was received at the end of the period, then the pricing rule would be

$$P = \frac{a}{(1+r)} + \frac{a}{(1+r)^2} + \frac{P}{(1+r)^2}. \tag{1}$$

The value P can be found by recursive substitution. It is P = a/r, the standard formula for valuation of a consol.

To value a life annuity relative to a redeemable annuity, de Witt needed to compare the value of a certain payout stream for an unknown number of periods with the value of a certain and permanent payout stream. It is helpful, in analyzing de Witt's approach, to start from the current theory of annuity valuation.[12] Let $S_{k,a}$ denote the probability that an individual who purchases an annuity at age a will be alive at age k, for k > a. Assume that the annuity is offered by a riskless institution, and that the risk-free interest rate is 100r percent per year. Further assume that this interest rate is constant over time and that there is a maximum feasible age, K. In this case, the expected present value of an annuity contract that pays 1 per period is

$$V_a = \sum_{k=a}^{K} \frac{S_{k,a}}{(1+r)^{k-a}}. \tag{2}$$

In this notation, life expectancy at age a, $E(L_a)$, is

$$E(L_a) = \sum_{k=a}^{K} S_{k,a}. \tag{3}$$

The difference between the right-hand side of (3), and the right-hand side of (2), illustrates the two potential interpretations of Ulpianus's valuation table.

By the time de Witt was considering the valuation of life annuities at different ages, the concept of present discounted value for certain income streams was widely understood, and it was applied in a variety of settings. De Witt's critical contribution was recognizing that life annuities, unlike permanent annuities, yielded a random set of payouts. He then built on two important intellectual advances of the previous century. The first

was a conceptual achievement, the development of formal methods in probability theory, in particular the concept of mathematical expectation. The second was an empirical achievement, the collection of detailed statistical information on births and deaths and the formulation of prototypical mortality tables.

With regard to the probability framework, de Witt was familiar with Huygens's research on probability methods and used his approach to compute the expected payout of life annuities where the date of the nominee's death was a random variable. De Witt's formulation for contingent claim valuation is essentially the same as the one that underlies current practice. With respect to data on mortality rates, de Witt offered only crude evidence on the age pattern of death. He drew on information about the payouts to annuitants who purchased annuities issued by Holland and by West Friesland. Rather than using these data to construct age-specific survival rates, he simplified the annuity valuation problem by dividing life into four intervals: ages 3–53, 53–63, 63–73, and 73–80. No one was assumed to live beyond the age of 80. De Witt assumed that annuitants were certain to live to age 53, and had a two-thirds chance of surviving until the 53–63 interval, a one-half chance of living to 63–73, and a one-third chance of surviving until the 73–80 age interval. With these assumptions, the valuation problem in (2) simplifies to

$$(4) \qquad V_a = \sum_{k=a}^{53} \frac{1}{(1+r)^{k-a}} + \frac{2}{3}\sum_{k=54}^{63} \frac{1}{(1+r)^{k-a}} + \frac{1}{2}\sum_{k=64}^{73} \frac{1}{(1+r)^{k-a}} + \frac{1}{3}\sum_{k=74}^{80} \frac{1}{(1+r)^{k-a}} .$$

Under this simplifying assumption about mortality patterns, and with r = .04, de Witt found that a unit annuity purchased by someone at age 3 was worth 16. By comparison, if one assumed that the distribution of ages at death was uniform between ages 3 and 80, a unit annuity would be worth 17.2. Both of these estimates may be contrasted with 25, the value of a consol with an interest rate of 4 percent.

Once de Witt brought the concept of mathematical expectation to the valuation of annuity contracts, much of the subsequent progress in refining these estimates took the form of improved precision with regard to mortality rates.[13] Several decades after de Witt's contribution, another Dutchman, Jan Hudde, published a detailed set of mortality rates based on nearly 1,500 annuities sold by Amsterdam in the late 1580s. Even though Hudde's data provided a much clearer description of age-specific mortality rates than did de Witt's approximations, the annuity values that emerged from Hudde's calculations were very similar to de Witt's. Hudde continued to work in de Witt's basic framework for annuity valuation, in particular by aggregating mortality risk into several broad age categories.

The work by de Witt and Hudde provided the foundation for linking annuity valuation to the age of the annuity's nominee. If the price of a city's consol was known, then tabulations like de Witt's could be used to select selling prices for life annuities for annuitants of different ages. This advance in valuation had a limited impact on the practical supply of annuities. Amsterdam sold annuities with age-dependent prices starting in 1672.[14] It does not appear, however, as though the practice of selling age-specific annuities was widely copied.

EDMUND HALLEY'S ANALYSIS OF ANNUITY CONTRACTS

The Dutch experience with age-graded annuities did not diffuse to other nations for nearly a century. During that period, mathematicians in both England and France made progress in analyzing annuity valuation. They obtained deeper and more powerful results than de Witt, and linked empirical mortality rates more closely to the annuity valuation issue.

The most notable contribution in this respect was made by the English astronomer Edmund Halley, roughly two decades after de Witt's work. In 1693, Halley published a paper that used a very detailed data set on births and deaths in the Silesian city of Breslau to construct a life table.[15] The existence of these data had been brought to the attention of the Royal Society by Gottfried Leibniz, and Halley, as the editor of the society's journal, was chosen to analyze them. Halley analyzed the birth and death data under the assumption that the population of Breslau was stable, when in fact it was probably growing during the period he considered. While this raises some difficulties with the general use of Halley's life table, it takes nothing away from the conceptual insights associated with the construction of a life table, or the application of this table to annuity valuation. Halley's work was an important contribution to the emerging field of demography, which had been advanced just a few decades earlier by John Graunt's publication of detailed estimates of births, deaths, and population size in London.[16]

TABLE 12.2.
EDMUND HALLEY'S VALUATION OF LIFE ANNUITIES

Age of Annuitant	"Years' Purchase:" Annuity Value as a Multiple of Annual Payout
1	10.00
5	13.40
10	13.44
15	13.33
20	12.78
35	12.27
30	11.72
35	11.12
40	10.57
45	9.91
50	9.21
55	8.51
60	7.60
65	6.54
70	5.32

Source: Geoffrey Poitras, *The Early History of Financial Economics, 1478–1776* (Cheltenham, England: Edward Elgar, 2000), 198.

Halley used his life table to compute the expected present value of the sum of future annuity payments for annuities purchased at various ages. Table 12.2 presents the results of his tabulations. Halley's key step forward, relative to de Witt, was the actual implementation of an equation similar to (2). He used the number of individuals who would be alive in k years, as a proportion of the number who were alive at the time of the annuity purchase, along with a discount factor $(1 + r)^{k}$, to calculate the expected present value of a promised annuity payout k years into the future. While this method yielded a more accurate method of annuity valuation than did de Witt's approach, it also gave rise to a much more complicated arithmetic problem. Since all such calculations had to be done by hand, this rendered Halley's methods difficult to apply in practice.

Another towering figure in mathematics at Halley's time, Abraham de Moivre, also contributed in an important way to the development of tractable rules for annuity valuation.[17] De Moivre imposed a set of functional form assumptions on the survival probabilities that underlay Halley's calculations and then derived simpler valuation rules under these assumptions. To achieve tractability, de Moivre approximated the age-specific rates of mortality as lying along a piecewise linear function, and he imposed a fixed maximum lifespan for all individuals. In the simplest case of a single linear function fit to all mortality rates, and under the assumption that the annuitant will not live more than K years after the start of the annuity payout, the expected present value of the annuity payout is

$$V^{*} = \sum_{k=1}^{K} \frac{1 - \frac{k}{K}}{(1 + r)^{k}} .$$

TABLE 12.3.
COMPARISON OF VALUATIONS FOR LIFE ANNUITIES AT DIFFERENT AGES

Valuation Method	Age 5	Age 10	Age 20	Age 50
De Witt	13.6	13.2	12.1	7.8
Halley	15.1	15.3	14.3	9.8
De Moivre	14.9	14.6	13.9	10.3

Source: George Alter and James C. Riley, 1986, "How to Bet on Lives: A Guide to Life Contingent Contracts in Early Modern Europe," *Research in Economic History* 10, 22–23.

De Moivre was able to offer relatively simple closed-form solutions for this valuation problem and for a number of related problems. Although de Moivre's *Annuities Upon Lives* was not published until three decades after Halley's paper for the Royal Society, Geoffrey Poitras makes a persuasive case for intellectual interaction between Halley and de Moivre, and even suggests that de Moivre may have provided Halley with the suggestion that he apply his life table to the problem of annuity valuation.[18] It is also possible that de Moivre contributed some of the probabilistic background that Halley needed to address the valuation problems.

To compare the analyses of de Witt, Halley, and de Moivre, George Alter and James C. Riley compared the expected value of a life annuity as computed by each of the three.[19] Table 12.3 presents this comparison for a range of different ages. For all but the oldest ages, Halley's calculations yielded the highest valuation. The difference is primarily due to a higher life expectancy at various ages in Halley's analysis relative to that of de Witt and de Moivre. In the decades following the work of this group, a number of other studies addressed related issues in annuity valuation.[20] The basic framework for annuity valuation developed during this period, however, is very similar to that used today.

Government Annuity Sales and Adverse Selection

The substantial number of wars between France, England, and Holland in the late seventeenth century and throughout the eighteenth century created a substantial need for national revenue. Selling annuities became a central tool for finance ministers trying to securitize future tax revenues and to raise immediate resources. There was great activity in the annuity market during this period, as well as some innovation in the structure of annuity products.

Holland was the first nation to issue annuities, following on the practices of large Dutch cities, and it was also the first nation to issue age-graded annuities. France has the most colorful history of annuity issue. France issued *rentes vagieres* during the Nine Years' War, which began in 1688. The most popular French annuity product, the *tontine*, is discussed briefly in the next section. England began to issue life annuities in 1693, and while it was not as successful as France in using annuities for government finance during the eighteenth century, it turned to annuities as an important source of public finance in the early nineteenth century.

The governments in all three nations sold at least some of their annuities, and in the case of England and Holland most of their annuities, at constant prices, regardless of the nominee's age. Evidence from all three nations suggests that the pool of annuity nominees

was selected from a subpopulation with lower than average mortality. This section offers a brief description of the available evidence on adverse selection in these markets.

THE DUTCH ANNUITY EXPERIENCE

Alter and Riley use data from annuitant registers to demonstrate the important role of selection in annuity purchasing. They compare the ages of the nominees for two annuities that were sold by the city of Amsterdam, nearly a century apart, with different pricing structures. The first annuity, sold without age variation in pricing, was the 1586–1590 Amsterdam life annuity. Roughly half of the nominees were under the age of ten, and nearly 80 percent were under the age of twenty. There were few very young nominees, however, as the risk of childhood illnesses made children under the age of five relatively risky choices as annuity nominees. The second annuity is the 1672–1674 Amsterdam annuity, which was sold at age-related prices. For this annuity, 24 percent of the nominees were under the age of ten, and 46 percent were under the age of twenty. Although raising the payout relative to the purchase price at older ages induced more annuity purchases by older nominees, Alter and Riley show that there remained substantial variation in the attractiveness of the annuity across different ages. They estimate that the expected present discounted value of the annuity payouts, relative to the annuity price, was highest between the ages of five and twenty-five. Thus the reduced, but still high, concentration of annuitants at younger ages is consistent with age-related purchasing that depends on the present value of the annuity contract.[21]

THE FRENCH EXPERIENCE: LIFE ANNUITIES AND TONTINES

Annuities issued by the French government during the eighteenth century have been widely studied, most recently by David Weir and Francois Velde.[22] France relied on a combination of tontines and traditional annuity contracts to raise revenue throughout the eighteenth century. The burden of meeting the payment obligations associated with these contracts has been widely cited as a key contributor to the fiscal difficulties that led up to the French Revolution. Moreover, there is an interesting political economy issue concerning the setting of annuity prices, and the extent to which such prices were set generously to build support for the monarchy.

Velde and Weir demonstrate that the pool of annuitants who subscribed to French life annuities was strongly selected toward individuals with long expected lives. Swiss syndicates based in Geneva developed secondary market contracts known as *trente demoiselles de Geneve* that represented shares in the annuity payments received on groups of thirty nominees. These nominees were young women, typically around age five, selected from healthy families. The nominees were usually smallpox survivors. By bundling the annuities on a group of lives, these syndicates diversified the idiosyncratic risk associated with any given individual's annuity stream.[23]

Alter and Riley tabulate information on the nominees for the 1771 Life Annuity Loan. Single-life annuities in this loan offered an 8 percent return, or sold at 12.5 years' purchase. The actual yield was somewhat higher, because some outstanding debt securities could be redeemed for the annuity purchase; Alter and Riley estimate that this made the effective interest rate 11.6 percent. They also estimate that the market-clearing return on these annuities, given prevailing interest rates on other securities, was more than three hundred basis points below this rate. The government apparently priced these contracts assuming that they would amortize over an average of twenty years, when in fact loan buyers were younger than this assumption implied. The average age of the Genevan nom-

This page: *Fund on the lives of young women.* This is an example of the contracts that were drafted to pool the annuity payments received by many beneficiaries and to redistribute the income across multiple investors. It displays a *soixante demoiselles* contract which described the terms of an arrangement for pooling the income from sixty annuities that were sold as part of the Royal French Life Annuity of 1781. The contract was drafted in Amsterdam, and the nominees for the annuities were Dutch girls between the ages of three and eight. By selling 750 shares at a price of 1000 guilders each, the directors of the fund had arranged to purchase 60 annuity contracts, each for 12,500 guilders. The annuity contracts returned 10 percent each year, but the investors in the *soixante demoiselles* contract received 6.5 percent each year, paid in two annual installments. The difference between the income received by the trustees of the *soixante demoiselles* contract and the distributions was invested in French royal securities so that the fund would continue to earn income and make distributions even as the number of surviving nominees declined. The securities in the fund at the time of the last nominee's death were to be divided among the investors, or otherwise allocated in accord with a majority vote of the *soixante demoiselles* investors at that time.

Opposite: A 1734 French tontine

Copia

IN DEN EERSTE MAY DES JAARS SEVENTIEN HONDERD SEVEN-EN [illegible]

Compareerden voor my ABRAHAM VAN BEEM, openbaar Notaris, by den Hove van Holland geadmitteerd, t'Amsteldam residerende,

De Heeren PIETER STADNITSKI en Mr. HENDRIK VOLLENHOVEN, als Directeuren,
En de Wel-Ed. Heeren ABRAHAM FOCK en ADRIAAN SCHARPE, als Commissarissen in de nabemelde Negotiatie.

Wonende de Heeren Comparanten binnen deeze Stad, my Notaris bekend.

Te kennen gevende, dat door de twee Heeren eerste Comparanten, ingevolge het door Hun uitgegeevene Bericht, van diverse Participanten, volgens geteekende Recepissen is genegotieert, een Capitaal van Seven mail Honderd Vyftig Duizend Guldens Hollandsch Courant Geld, tegens zoodanige Jaarlykse Interest, als hier na zal worden gemeld, ten einde of zelve opgenomen Penningen te employeeren, tot den aankoop van Een Millioen en Vyftmal Honderd Duizend Livres tournois, gevestigd op 30 Contracten, ieder van Livres 50000:- of 60 Contracten, ieder van Livres 25000:- in Capitaal van de Koninglyke Fransche Lyfrente Negotiatie van Maart 1781 te rente 10 pCt. op een Hoofd, dog belast met de korting van de tiende Penning, en dezelve te berekenen met gemelde dat Interest zedert Primo July 1781. tot een Stuyvers de [illegible] onder dan ook begreepen alle de Proviien en Onkosten te Parys, alle kosten [illegible] en Zegels, en voorts alle onkosten van Provesie, Premie, en Courtagie &c. hoe ook genaamt, wegens't oprichten dezer Negotiatie, en voorts dat dezelve Contracten zouden worden gecontribueerd, op de Lyven van 30 of 60 Jonge Juffervrouwen, alle tusschen de 2 en 8 Jaaren, en gesteld op de namen en Surnamen van de twee Heeren laaste Comparanten en van my Notaris, alles om zodanige redens en met alzulke precautien en voorzorgen, als by zeekere Acte op heeden ten overstaan van de Notaris GERRIT BOUMAN en Getuygen, door gemelde twee Heeren laaste Comparanten en my Notaris, neevens de twee Heeren eerste Comparanten gepasseert, klaar vermeld, en welke Acte, onder de Papieren dezer Negotiatie, ter Vlue van de Eigenaars en Geinteresseerdens, ten Comptoire van my Notaris, als Notaris van dit Fonds, berustende blyft.

Ingevolge, en ter volbrenging van 't invoege voormeld uitgegeevene Bericht, zyn door de twee Heeren eerste Comparanten, aan my Notaris, ten overstaan, en in presentie van de twee Heeren laaste Comparanten ter hand geteld; Zo alsik Notaris, ook bekenne ten Fine nagemeld, overgenoomen te hebben

Negen-en Vyftig Contracten, van Vyf-en-Twintig Duizend Livres Capitaal, ieder op een Hoofd, rentende 10 pCt., onder korting van de 10de Penning, van de Koninklyke Fransche Lyfrente Negotiatie, geinstrueert by Edict van Maart 1781. Staande alle op de Namen van ADRIAAN FOCK, ADRIAAN SCHARPE en ABRAHAM VAN BEEM, gemeenelyk en belegd op de Lyven hier na gemeld. Zynde reeds op de Contiatie, een Contract van £ 250001:-, belegt ten Lyve ELISABETH JUDITH DE VRIES, Nº. 74, door haar overleden (voo egevallen den 24 Februy 1787. Waar van nu my Notaris de dood Cedul is gebleeken) Vervallen, zynde de overige Contracten Genummert en geconstitueert als volgt:

Nº. 30. Juffvr. *Henriette Elizabeth Poute.*
31. —— *Constantia Gerardina Nobel.*
32. —— *Cornelia Elizabeth Spilher.*
33. —— *Johanna Josina van de Velde.*
34. —— *Carolina Josina van Weede.*
35. —— *Anna Danckerts.*
36. —— *Johanna Hermina Douwes.*
37. —— *Florentia Maria Perfter.*
38. —— *Maria Anna de Lange.*
39. —— *Schilla Helena Bruyn.*
40 —— *Cornelia Janser.*
41. —— *Anna Carolina de Wit.*
42. —— *Geertruyda Helena Holtrop.*
43. —— *Margaretha de Vries.*
44. —— *Adriana Wilhelmina van Pembrock.*
45. —— *Maria ten Cate.*
46. —— *Henriette Gilsgonda Wind.*
47. —— *Hubertia Gerarda Nahuys.*
48. —— *Elizabeth Sygar.*
49. —— *Henriette Charlotte Hugues.*
50. —— *Jacoba Maria van Loar.*
51. —— *Sophie Rolland.*
52. —— *Maria Cornelia Alewyn.*
53. —— *Clara Paulina Bauwhauer.*
54 —— *Catharina Bicker.*
55. —— *Anna Conradina Muyken.*
56. —— *Catharina Henrica Perfter.*
57. —— *Anna Maria Wilhelmina Tufingh.*
58. —— *Susanna Poute.*
59. —— *Maria de Vries.*

Nº. 60. Juffvr. *Jeanne Mathilde Berg.*
61. —— *Agnes Catharina Calkoen.*
62. —— *Clasina Elizabeth Vomberg.*
63. —— *Petronella Johanna Elizabeth Nobel.*
64 —— *Maria Anna Huldolf.*
65. —— *Helena Anna Swagerman.*
66 —— *Anna Ernestina Bauwmeer*
67. —— *Philes Elizabeth Lekkost.*
68 —— *Marya Bosch.*
69. —— *Cornelia Anna Kleinpenning.*
70. —— *Margaretha Elizabeth van Lennep*
71. —— *Josephina Geertruida Perfter*
72. —— *Margaretha Alida Tufingh.*
73. —— *Agneta Wendelaar Bicker.*
74. —— *Anna Elizabeth Nepveu.*
76. —— *Johanna Alegda Voomberg.*
77. —— *Hendrina Wilhelmina Krieger.*
78. —— *Margaretha Helena Alewyn.*
78. —— *Joanna Bosch.*
80. —— *Clara Susanna Lodowica Hovy*
81. —— *Anna Catharina Lekkost.*
82. —— *Philis Valkina Deiman.*
83. —— *Hendrina Christina Kleinpenning.*
84. —— *Jacoba Marsha Armenault.*
85. —— *Magdalena Margaretha Hermina Smitt*
86. —— *Margaretha Clara van de Pol.*
87. —— *Schilla Catharina Baumhauer.*
88. —— *Anna Jacoba Henrietta Carver Hoost*
89. —— *Margaretha Nepveu.*

Alle welke Contracten door my Notaris in presentie van de Heeren Comparanten zyn gelegd in een stalke Doos gesloten met drie different werkende Slooten, waar van een Sleutel aan gemelde Heeren Commissarissen, een aan yeeren, ande Heeren Directeuren is ter hand gesteld en een onder my Notaris berustende blyvt, ten einde dezelve Doos ten mynen Comptoire en vervolgens by den Notaris in der tyd van dit Fonds als een Hypotheecq dezer Negotiatie ten behoeve der Geinteresseerdens bewaard te worden.

En vermits als na door de dadelyke belegging van de voornoemde Somma van Sevenmail Honderd Vyftig Duizend Guldens, 09 Lyvrenten in voegen als boven gemeld staat, en de Overgifte der Originele Contracten in handen van my Notaris, deze Negotiatie zyn volkomen beslag bekomen heeft, zo beloven zy Heeren Eerste Comparanten als na voor de verdere Invordering der Jaarlykse Lyvrenten, voor Reekening en ten behoeve der Geinteresseerdens te zullen aangedragen en tegens Intrekking der Ungegeevene Recepissen aan ieder houder derzelve weder te zullen ter hand stellen een Copie Authentiq dezer Acte waar onder zal gesteld worden een Quitantie van anadeel in deeze Negotiatie ter Somma van een Duyzend of van Vyv Honderd Guldens, na dat ieder zal hebben gefourniereerd, welke aandeelen alle door de twee Heeren Eerste Comparanten als Directeuren geteekent en Genummert van Nº. 1 tot Nº. 750. inclusis door my Notaris gecontraligneert of geprotocolleert zullen worden, zo egter dat twee Aandeelen ieder van Vyv Honderd Guldens onder gelyke Nummer dog onderscheide door de Letters A en B. zullen worden ingegeeven, zulka dat in alle gevallen alle de uitgegeevene aandeelen te samen geteekent met meerder dan *f* 750.000 zullen beloopen.

Verklarende zy Heeren Comparanten wyders als nu ieder houder van gedenig invoege voormeld geteekent en geprotocolleerd Aandeel te houden voor mede participant en Eigenaar van de meergemelde Contracten van Lyvrenten voor gedagte Somma van Een Duyzend of van Vyv Honderd Guldens als de Quitantien van Aandeel zullen inhouden.

Edoch alleenlyk onder deeze Conditien waarop de Negotiatie is aangegaan.

Art. I.

Dat by de Ingiften der Copien Authentiq defer Acte en de Quitantien van Aandeel zal betaalt worden voor 6 Maanden Interesten verschenen 1 Mey 1787. van een Aandeel van Een Duizend Guldens, Twee en Dertig Guldens en negen Stuivers; en van een Aandeel van Vyv Honderd Guldens, Sestien Guldens vyv Stuivers, zynde gereekent à 6½ pCto. en dat voorts by ieder Aandeel zullen gevoegt worden 10 Coupons geteekent door den Heer Directeur VOLLENHOVEN om daar op alle Sex Maanden op 1 November en 1 Mey de Interesten te kunnen Ontvangen, zullende by de Ontvangst der Laatste Coupon ter bekoming van nieuwe Coupons de Obligatien vertoond ende afgeveering derzelve op dezelve genoteert moeten worden.

Art. II.

De Renten die Jaarlyks of wel ieder half Jaar na voldoening der voorschreeve Interessen zullen komen over te schieten, zullen terstond weder besteed worden ter Aankoop van Fransche Konnikiyke Effecten t'zy in Lyfrente, en by manquement of groote duurte, in andere Soorten; welke alzo zan te Koopene Effecten verkeeren, indien zulks kan geschieden, zullen geteld worden en Naam van der Heeren Commissarissen en den tydelyken Notaris van dit Fonds, en in alles geen onder den Lens gemelde, by de overige Effecten dezer Negotiatie, en invoegen als voren [illegible] worden

Art. III.

Dat vermits volgens de gewoonte lewis Reekening in ieder Aarlien Maanden, een hoofd, van de Seelig, kan en moet Steeven, als dan het verlies daar ieder te vroeg thervend hoofd, na gemeg met ½ pCto. 's Jaars vermindering van Interest zou kunnen vergoed worden, zo als ook ader, boven de kans levend hoofd ook het vermeerderen der Interest, met ½ pCto. 's Jaars zoude toelaten, waar door in beide gevallen, het opteleggen Capitaal, gemeenaam zoude blyven Accrescerende om by 't overlyden van het laatste hoofd weder gelyk aan de Inlaag te zyn. De Heeren Eerste Comparanten hebben vermeend dit het eenvoudigste middel tot herstel van 't geene toeg: de kans gebeuren mogt: zoude zyn, dog vermits de verandring van Interest egter juist met onmiddelyk, op het Eerste onregelmat ge in den loop der Verlervingen nodig is, zo zullen de Heeren Directeuren alvorens tus het eerste over te gaan de Geinteresseerdens Convoceeren, en als dan zwelegd worden of men de 6½ pCto. zal blyven nukeren, en dus de Negotiatie eens hoewel langzaam, tot een einde hoopen, dan of men de Interest iets verminderen zal, om dezelve beständig te doen zyn, zullende 't besluit in dat geval genomen worden by meerderheid van Stemmen Geschaleert na de hoe grootheid van teders Interest.

Art. IV.

Dat indien deeze Negotiatie tot den uiteinde haar regulaire loop houd en de Interessen tot by 't afsterven van 't laatste Lyv by deeze oprichting benoemd, betaald zyn: de gezamentlyke Geinteresseerdens de aangekeurte Effecten verdeelen zullen of zodanige andere Schikkingen beraamen als op dat tyd door de Meerderheid zal goedgevonden worden.

Art. V.

De Directeuren zullen niet dan de ouwermydbare Kosten en 1 pCto. provisie van 't montant der te ontvangene Reuten (en geene van de intekoupene Effecten) in Reekening brengen.

Art. VI.

De Directeuren zullen by de betaling der Coupons een exacte Reekening der Negotiatie ter Visie en Examen van de Deelneemers suppediteeren op dat een ieder instaat zal kunnen zyn, hun Beliier te beoordeelen.

Art. VII.

En eindelyk dat by overlyden of afstand van een der Heeren Directeuren, Commissarissen of Notaris van dit Fonds, zal worden gehandeld conform de bepalingen by 't uitgegeevene Bericht beschreeven, waar van een Exemplaar aan de Groofe dezer Geannexeert is, om zig daar na in allen gevallen te reguleeren.

En verzoegden de Heeren Comparanten hier van op te maken Acte, de Groofe dezes te bewaren onder de Papieren dezer Negotiatie en aan de respective Geinteresseerdens na rato van hun Aandeel in de Negotiatie Copien Authentiq dezer Acte uit te leeveren.

Gepasseert binnen Amstelaam in Presentie van ABRAHAM JACOB BROES en JAN BORGHORST als Getuigen.

(was Geteekend)

PIETER STADNITSKI, HEND. VOLLENHOVEN, ABRAHAM FOCK, A. SCHARPE, A. J. BROES, J. BORGHORST, en A. van BEEM Notaris.

Accordeerd met de Minute

In Amstelaam 5 Mei Aº. 1787.

Deeze Sub. Nº. [illegible] door my Ondergeteekende Notaris ten Protocole aangeteekent

Ontvangen van
een Somma van EEN DUYZEND GULDENS, voor een Aandeel in deez' Negotiatie, waar van de Interessen, conform de bygevoegde Coupons, op primo November en primo Mei zullen betaald worden.

Amstelaam, 8 Mey Aº. 1787.

} als Directeuren

TONTINE, Edit d'Aouſt 1734.

2. Claſſe.

1 Subdiviſion

PARDEVANT les Conſeillers du Roy, Notaires au Chaſtelet de Paris, ſouſſignez, furent preſens Meſſire MICHEL ESTIENNE TURGOT, Chevalier, Seigneur de Souſmons, Bons, Uſſy, Potigny, Periers, Brucourt, & autres lieux, Conſeiller du Roy en ſes Conſeils, Preſident au Parlement & en la ſeconde Chambre des Requeſtes du Palais, Prevoſt des Marchands; Claude-François Petit, Ecuyer, Conſeiller du Roy, Quartinier; Jean-Baptiſte de Santeul, Ecuyer; Jean-Baptiſte Tripart, Ecuyer, Conſeiller du Roy & de la Ville; & François Touvenot, Ecuyer, Conſeiller du Roy, Notaire au Chaſtelet, tous Eſchevins de cette Ville.

Leſquels ont dit, que le Roy par ſon Edit du mois d'Aouſt 1734. regiſtré où beſoin a eſté, auroit, pour les cauſes y contenuës, ordonné qu'il ſeroit par les Commiſſaires que Sa Majeſté nommeroit, vendu & aliené quatorze cens ſoixante-trois mille livres actuelles & effectives de rente viagere, ſous le titre de Tontine, ſujette à accroiſſement, diſtribuée en quinze claſſes, compoſées de differentes diviſions, dont chaque action ſeroit de trois cens livres de capital; leſdites rentes à prendre ſur le produit des droits d'Aydes & Gabelles, & des cinq groſſes fermes, que Sa Majeſté a ſpecialement & par privilege, affectez, obligez & hypothequez au payement & continuation des arrerages deſdites rentes, même par préference à la partie du treſor Royal, dont les conſtitutions ſeroient faites à ceux qui deſireroient les acquerir ſous leurs noms, ou autres qu'ils nommeroient, avec faculté à chaque perſonne de prendre tel nombre de parties de rente qu'il luy plairoit dans chaque ſubdiviſion de ſa claſſe, pour leſquelles il luy ſeroit expedié des contracts: Que de la rente de chaque rentier qui viendroit à deceder, un quart des arrerages de ſadite rente ſeroit éteint à la deſcharge des revenus de Sa Majeſté, & les trois autres quarts appartiendroient par accroiſſement aux ſurvivans de la ſubdiviſion de ſa claſſe, entre leſquels ils ſeroient diſtribuez d'année en année juſqu'au dernier mourant; en ſorte que le dernier vivant de chaque ſubdiviſion de chacune deſdites claſſes, recueilleroit ſeul les trois quarts du revenu des capitaux qui compoſeroient ladite ſubdiviſion, & que leſdites rentes pourroient auſſi eſtre acquiſes par les eſtrangers non naturaliſez, même ceux demeurans hors du Royaume; à l'effet de quoy Sa Majeſté auroit renoncé à tous droits d'aubaine, confiſcations, & autres qui pourroient luy appartenir: pour, des arrerages deſdites rentes & des accroiſſemens, joüir par les acquereurs leur vie durant, comme de leur propre choſe, vray & loyal acqueſt, en vertu des contracts qui ſeroient faits par leſdits Sieurs Prevoſt des Marchands & Eſchevins, & eſtre payé des arrerages deſdites rentes à bureau ouvert par chacune année, en deux payemens, ſur leurs quittances en parchemin, paſſées devant Notaires en la forme portée audit Edit, à commencer du premier Octobre 1734. pour ceux qui auroient fourni leurs fonds avant le premier Janvier 1735. ſans que leſdites rentes puiſſent eſtre ſujettes à aucunes ſaiſies pour quelque cauſe que ce ſoit, même pour les deniers & affaires de Sa Majeſté, ni eſtre reduites ni retranchées ſous quelque pretexte que ce puiſſe eſtre: en outre, que les rentes qui ſeroient acquiſes par les eſtrangers, ſeroient exemptes de toutes lettres de marque & de repreſaille, ainſi qu'il eſt plus au long porté audit Edit; en execution duquel a eſté fait vente & alienation par Meſſieurs les Commiſſaires du Conſeil, Procureurs ſpeciaux de Sa Majeſté auxdits Sieurs Prevoſt des Marchands & Eſchevins, deſdites quatorze cens ſoixante-trois mille livres de rente, par contract paſſé en vertu des Lettres patentes y énoncées, pardevant Bourron & ſon confrere

inees for the loan was 11.4 years. The average age was 17.4 years for Amsterdam nominees and 16.7 for all nominees pooled together.[24]

The tontine was a form of annuity contract that was used heavily in France but that was also used in some other nations. Tontines were named for their creator, an Italian banker named Lorenzo Tonti, who suggested this financial product to France's Cardinal Mazarin in 1652. While the initial plan was rejected by the Parlement of Paris in 1653, in part because the proposed interest rate on the tontines was higher than the prevailing rate on life annuities, France eventually chose to issue tontines.[25]

Tontines differed from standard life annuities in one important respect. Rather than promising a given payment to each nominee, provided he or she was still alive at the time of the payment, tontines committed the government to make a given aggregate payment to all of the tontine buyers who were alive at a given date. In return for an initial lump-sum payment, purchasers of tontines therefore received life annuities with an increasing payment stream. The rate of payment increase was uncertain and depended on the mortality experience of the pool of tontine buyers. Those who survived benefited because they received payouts that would previously have gone to those who died. When the second-to-last participant in a tontine pool died, the sole survivor received the entire remaining principal. The tontine thus combined insurance against outliving one's resources, the traditional component of an annuity, with an element of lottery-style gambling.

In some cases, tontine issues were structured so that the resources needed to pay the tontine annuity were not held by the government, but rather were held by a third party that was viewed as less subject to default risk. Even when this approach was not used, it was easier for a government to project the future cost of financing a tontine than to project the cost of a life annuity. With a tontine, aggregate outlays are constant until the longest-surviving tontine buyer dies. With a life annuity, the stream of future payouts depends on the mortality experience of the nominees, and is therefore uncertain *ex ante*.

French tontines were widely subscribed and for some time were an important source of government finance. Tontine purchasers were grouped into broad age classes, and the associated prices reduced the incentives for only young buyers to participate in these schemes. Alter and Riley report that purchasers of the 1696 Tontine were classified into fifteen different age groups, and that the yield varied from just over 7 percent for the youngest age classes to over 14 percent for those who were elderly at the time of purchase.[26] The differences in payouts across age groups, in contrast to the differences in life expectancy, determined the incentive to invest at different ages. Robert M. Jennings and Andrew P. Trout analyze data from the 1696 Tontine and find that buyers were concentrated in the age groups at which they estimate the highest prospective returns.[27] Most of the tontine buyers were also small investors. This explains the complex political economy issues associated with the payouts on tontines, and in particular the possibility that by offering above-market rates of return on tontines, the French government hoped to bolster its public support.

The French experience with tontines ended in the latter half of the eighteenth century. In 1763, only four years after the last tontine offering, future sales were banned. In 1770, all future tontine payments were frozen at their current levels, effectively converting the existing pool of tontines to life annuities, with a 10 percent minimum rate of payout. Life annuities rather than tontines became the predominant form of French government finance after this date. Surprisingly, even though tontine buyers had been categorized into age classes at their time of purchase and Antoine Deparcieux had published a clear de-

scription, in French, of how to value age-contingent annuities,[28] the life annuity issue of 1770 and subsequent years was offered at a flat rate, with no age gradation.

ENGLISH EXPERIENCE WITH ANNUITY OFFERINGS

The English government, like the French, issued tontines, but these products were never as popular in England as they were in France. English tontine sales often failed to raise their revenue targets, and the tontines were sometimes sold in conjunction with life annuities or with additional purchase inducements, such as tickets for an immediate lottery. The English, however, developed an active and deep life annuity market, and the size of this market ultimately surpassed that of France and Holland.[29]

The English sold life annuities for a constant price, regardless of the age of the annuity nominee, until 1808. While the French and Dutch experience shows that selling annuities at a constant price led to a high fraction of the nominees being young, the English annuity sold in 1746 offers one of the first examples of an organized speculation designed to take advantage of flat-rate pricing. Francis Leeson presents data on the country of residence for nominees in the 1745, 1746, and 1757 Life Annuity sales. He shows that while 10 percent of the 1745 nominees and 3.3 percent of the 1757 nominees were from Holland, 35.6 percent of the 1746 nominees were Dutch.[30] England's chief government actuary, John Finlaison, argued that the 1746 data suggested that Dutch syndicates had purchased a substantial share of the 1746 issue, and that they had enrolled young Dutch girls as the nominees.[31] Ray D. Murphy describes this as "the first studied effort at selection against a fund. The Dutch apparently appreciated what the English did not—that annuities based on younger lives were more valuable, and that women lived longer than men."[32]

Casey G. Rothschild presents detailed evidence on the nature of selection in the Irish tontines of 1773, 1775, and 1777. He analyzes the ages and genders of the nominees for these tontines and cross-tabulates age of the nominees with their nationality. He finds that the average age of the Swiss female nominees for the 1775 tontine, for example, was 3.7 years less than the average age of the nominees from other nations. This suggests that Swiss investors, perhaps in syndicates like those that offered the *trente demoiselles* products described above, recognized the principles of heterogeneous mortality rates and their impact on the value of annuity products.[33]

While the English Treasury used annuities as a source of government finance throughout the 1700s, it relied more heavily on consols. In the early 1800s, however, this balance shifted as part of a campaign to draw down the debt that had been built up during the war-ridden eighteenth century. In 1808, Chancellor of the Exchequer Spencer Perceval embarked on a program of issuing government annuities in exchange for outstanding consols. This financial program was designed to speed the reduction in the governments' debt, which had increased tenfold during the 1700s. A key element of this program was the rate of exchange at which annuities could be substituted for perpetuities. This rate was set in such a way that the annuity exchange was very attractive. The conversion rate was calculated using the Northampton mortality table, which was based on births and deaths in the English town of Northampton in the mid-1700s. The mortality rate for this sample was substantially higher than the mortality rate for annuitants, and it did not reflect the mortality improvements that had occurred since the time when the data were collected.

Finlaison demonstrated that the annuitant population experienced much lower mortality than the Northampton table predicted. He also showed that the mortality rate for male annuitants was higher than that for female annuitants, and on the basis of this evidence argued for offering annuities with payouts that varied by age and sex. These sugges-

tions were incorporated in the 1829 Annuities Act, which made the minimum age for annuity purchase fifteen and the maximum age ninety. The age-specific payouts stipulated by this act were based on the mortality experience of annuitants who purchased English annuities during the 1700s, and in most cases the purchases were made when the annuitants were relatively young. The mortality rates at very advanced ages of individuals who purchased annuities when they were young are similar to those in the population at large. The result was that under the 1829 act's pricing rules, annuities purchased at very old ages returned a substantial fraction of their purchase price each year. At age ninety, for example, roughly two-thirds of the purchase price was repaid each year.

The expected return on an annuity, written on behalf of a ninety-year-old nominee, could be quite high if the nominee was in good health. This led to speculative activity in the annuity market. Speculators searched for healthy old men, particularly in Scotland where mortality rates were perceived to be low, and nominated them for annuities. These nominees were then provided with medical care, food, and other necessities to reduce the likelihood of life-threatening illness. J. Francis reports:

> The inhabitants of [some] rural districts . . . were surprised by the sudden and extraordinary attention paid to many of their aged members. If they were sick, the surgeon attended them at the cost of some good genius; and if they were poor, the comforts of life were granted them. In one village . . . the cottagers were rendered jealous by the incessant watchful attention paid to a nonagenarian by the magnate of the place . . . the laird had been heard to say that he took a great interest in his life, and that he even allowed the doctor twenty-five golden guineas a year, so long as he kept his ancient patient alive.[34]

The profitable speculation on older lives was substantially reduced by 1834, when the maximum payout on an annuity was reached for an annuitant of age eighty, and the Chancellor was allowed to refuse to sell annuities to third-party nominees who did not hold some financial interest in the annuity. Life annuities continued to be used as an active source of government revenue in England throughout the nineteenth century.

Rothschild shows that the switch to gender-dependent pricing in 1829 led to substantial changes in the gender mix of annuity nominees. Women were more likely to be nominated before the change in pricing than afterward.[35] Whether this reflects the decisions of individual annuity buyers or organized syndicates in the market is not clear.

Private Annuities

Government-backed annuities were sold to raise revenue for wars and other expenditure programs, and they were purchased both by individual investors and by syndicates. Indi-

Opposite: *Negotiatie for an Orphanage in Vlaardingen. 9 May 1800. Lottery fund embedding a Tontine with five classes.* The issue consisted of 1500 shares of 50 guilders in prizes, raising 75,000 guilders for the orphanage. The fund offers a lottery with 100,000 guilders in prizes, and a first prize of 10,000 guilders. The prizes were not paid in cash but in the form of 3 percent bonds issued by the orphanage, or a participation in a tontine offering between 3 and 5 percent depending on the age of the nominee. The majority of investors would receive a bond or a participation in a tontine for the exact amount of their participation.

The document represents a participation in the tontine, on the life of a twenty-three-year-old woman. In order to collect the interest in the tontine, the holder had to present the annual coupon, signed on the back by either a notary or a member of the clergy, attesting that the nominee was still alive. The 1828 coupon is still attached to the document, suggesting that the nominee may have died at the age of fifty-one.

DANKBAARHEID EN ERKENTENIS

NEGOTIATIE.

Groot

VYF EN ZEVENTIG DUYZEND GULDENS,

Geconſenteerd by Decreet van het

VERTEGENWOORDIGEND LICHAAM

der BATAAFSCHEN VOLKS,

In dato 9 Mey 1800.

Opgerigt ter Inſtandhouding van het WEESHUYS der Stad

VLAARDINGEN.

Deeze NEGOTIATIE beſtaat uit *Vyftien Honderd Aandeelen* à VIJFTIG GULDENS ieder, op welke by Looting zyn getrokken.

1	Prys a *f* 10000.	*f* 10000 - : -
1	—— a . 5000.	5000 - : -
3	—— a . 1000.	3000 - : -
5	—— a . 500.	2500 - : -
5	—— a . 250.	1250 - : -
10	—— a . 125.	1250 - : -
25	—— a . 100.	2500 - : -
450	—— a . 50.	22500 - : -
500	Pryſen bedraagen	*f* 48000 - : -
1	Prämie voor de *f* 10000.	250 - : -
1	—— na de 10000.	250 - : -
1	—— voor de 5000.	125 - : -
1	—— na de 5000.	125 - : -
10	—— voor het eerſte en laatſte uitkomende Lot, op ieder der 5 trekdaagen a *f* 125. - : - ieder	1250 - : -
Bedraagende deeze 514	Pryzen en Prämien.	*f* 50000 - : -
En nog 1000	Pryzen a *f* 50.	50000 - : -
	Maakende te ſaamen.	*f* 100000 - : -

Alles onder de volgende Conditien.

Dat voor de eerſtgemelde 500 *PRYZEN* en 14 *PRÆMIEN*, bedragende VYFTIG DUYZEND GULDENS, zullen worden afgegeeven OBLIGATIEN, Rentende tegens DRIE *PerCento*.

Dat voor de laastgemelde 1000 *PRYZEN*, mede bedragende VYFTIG DUYZEND GULDENS, zullen worden afgegeeven, INSTERVENDE LYFRENTEBRIEVEN verdeeld in Vyf Claſſen ieder van Twee honderd *Aandeelen*.

Dat in voorſz. Claſſen zullen worden geſteld, en aan de Houders van dien, tot zoo lange de Langſtleevende in iedere Claſſe zal overblyven, zal worden betaald een Jaarlykſche INTEREST als volgt, te weeten in de:

Eerſte CLASSE.
PERSOONEN beneeden de 12 Jaaren. . . . . *De ſomma van* *f* 300 : - : -

Tweede CLASSE.
PERSOONEN van 12 tot 24 Jaaren. . . . . *De ſomma van* *f* 350 : - : -

Derde CLASSE.
PERSOONEN van 24 tot 36 Jaaren. . . . . *De ſomma van* *f* 400 : - : -

Vierde CLASSE.
PERSOONEN van 36 tot 48 Jaaren. . . . . *De ſomma van* *f* 450 : - : -

Vyfde CLASSE.
PERSOONEN booven de 48 Jaaren. . . . . *De ſomma van* *f* 500 : - : -

Dat

NEGOTIATIE DEELNEEMERS DEZER AAN DE VAN WEGENS REGENTEN VAN HET

VLAARDINGSCHE WEESHUYS

vidual annuity buyers presumably valued these contracts for their insurance component, namely, the protection that they offered against outliving one's resources, as well as for their prospective returns.

By the middle of the eighteenth century, private groups had begun to recognize the value of annuities in providing insurance and retirement income. In 1759, in the United States, Pennsylvania chartered the Corporation for the Relief of Poor and Distressed Presbyterian Ministers and Distressed Widows and Children of Ministers, which provided survivorship annuities for the families of ministers.[36] Nearly fifty years later, in 1812, the Pennsylvania Company for Insurance on Lives and Granting Annuities was founded. It offered life insurance and annuities to the general public and was the forerunner of modern stock insurance companies. It offered a retail insurance product that was of interest to individuals facing unknown mortality rates and searching for longevity insurance.

Annuity markets were small throughout the nineteenth and into the twentieth centuries, and the prices of annuity products varied significantly over time with economic conditions and revisions to estimates of mortality rates.[37]

Throughout the nineteenth century, the provision of retirement income remained an individual affair. An individual could choose to purchase an annuity, but the market for these products was small. In part, this reflected the array of nonmarket alternatives that could be relied on to provide for income in old age. Younger family members would be a primary source of such support, and in an agrarian society in which older individuals often lived with at least some of their children, the need for market-provided retirement income was limited. Industrialization and greater geographic mobility changed this situation, and by the early part of the twentieth century, industrial firms began to offer retirement income to their employees. Annuities offered one way to provide such an income stream.

The discussion so far has focused on individual annuities, but in the twentieth century, group annuity policies developed. The Metropolitan Life Insurance Company pioneered the group annuity market, which is linked to corporate defined-benefit pension plans, in the early 1920s. Marquis James explains that life insurance companies began underwriting corporate group life, health, and disability policies following World War I.[38] Providing life annuities to retirees was a natural extension of this business. In 1921, Metropolitan began managing corporate pension programs, collecting contributions while workers were employed and, in return, paying out benefits when they were retired. Metropolitan introduced its corporate retirement program for its own employees in 1925 and began actively marketing "group annuities," the name for structured pension programs, in 1927. In the first year of operation, Metropolitan sold only thirty contracts covering fewer than 40,000 individuals.

The economic distress of the early 1930s stunted the growth of the group annuity market. More important, the passage of the Social Security Act of 1935, and the associated promise of a minimal retirement benefit for workers, reduced the demand for retirement income insurance on the part of workers. By 1941, only 269,101 individuals were covered by group annuity policies with the Metropolitan Life Insurance Company.[39] The growth of employee benefits in general during World War II, in part because benefits could be increased without violating the terms of wartime wage controls, led to expansion of group annuity policies and the associated corporate pension programs. Louis Dublin describes a typical pension program as requiring both employer and employee contributions during the employee's active service. In return, the employee was eligible to receive an annuity beginning at age sixty-five, with some provisions for retirement at other ages. At retirement, the employee could typically choose between a lump-sum payout of his total con-

tributions and the "paid-up option," in which these contributions were used to purchase a life or joint life annuity. Employer contributions were usually applied to purchase an annuity. The goal of most group annuity plans was to provide, in conjunction with individual benefits from Social Security, a retirement income that replaced between 40 and 60 percent of the retiree's earnings from employment.[40]

The decades immediately following World War II witnessed rapid growth of corporate defined-benefit pension plans and the associated group annuities paid to retirees. Several high-profile corporate bankruptcies, and the associated failure of pension plans that were inadequately funded, led to passage of the Employee Retirement Income Security Act (ERISA) of 1974. The subsequent regulatory structure that faced corporate defined-benefit plans, along with growing worker demand for portable pension programs, shifted the retirement provision landscape from defined-benefit to defined-contribution plans during the 1990s. In the next few decades, group retirement annuities are likely to become less important, while there will be growing interest in individual retirement annuities as more individuals reach retirement age with substantial balances in self-directed defined-contribution pension plans.

Conclusion

The history of the annuity market in early modern Europe offers interesting insights on the broader development of financial economics. During a period of roughly three centuries, the major nation-states in Europe relied substantially on the sale of life annuity contracts to finance wars and other public expenditures. The nature of annuity products evolved over this time, from simple contracts that paid the same amount to all buyers, regardless of their age or gender, to more finely graded products that more closely resemble modern private insurance annuities. Leading mathematicians of this period contributed to important advances in the pricing of annuity contracts. The history of annuities also offers evidence of the role of sophisticated speculation by private sector investors. Not only did individuals decide whether or not to purchase annuities on the basis of their expected return, but syndicates arose to invest in annuity contracts when it was possible to profitably speculate against the governments that were selling them.

Through most of the sixteenth, seventeenth, and eighteenth centuries, government annuities were viewed purely as a financial instrument that could be sold to raise revenue, rather than as a means of offering retirement security to older individuals in the population at large. Near the end of this period, however, as private insurance markets became more developed and individuals participated in friendly societies and obtained insurance in other ways, there were calls for more direct government involvement through both regulation and possibly even direct provision of annuity income.

Richard Price, an actuary who had been instrumental in advancing the private life insurance industry in England, proposed in 1772 that the government should tax workers during their wage-earning years and provide them with an annuity when they were no longer able to work, or provide their survivors with a benefit at the time of death. Price had analyzed the pricing formulae of a number of private insurance societies that had been formed in London in the first half of the eighteenth century, and he concluded that these organizations were not charging enough to deliver the survivor benefits that they were promising to their participants. He foresaw a private market failure in delivering a product that was of substantial interest to many working households, and therefore suggested direct government involvement.[41] His proposal for a form of "social insurance" was

more than a century ahead of the first practical policy discussion of such plans, which took place in Germany in the latter part of the nineteenth century. In the early twentieth century—1911 in Great Britain (the National Insurance Act) and 1935 in the United States (the Social Security Act)—governments became involved in the direct provision of group annuities to large segments of the population. The long-run impact of these annuity programs on government finances still remains to be seen.

13

John Law

Innovating Theorist and Policymaker

ANTOIN E. MURPHY

The last decade of the seventeenth century and the first two decades of the eighteenth century was a period of profound financial innovation. It was an era that created lasting institutions such as the Bank of England and some of Britain's major insurance companies, but it was also a time that would be long remembered due to the rise and collapse of the Mississippi Company in Paris and the South Sea Bubble in London. A great part of this financial innovation was due to someone who had been sentenced to death in the year of the creation of the Bank of England—1694—but who had become the equivalent of the prime minister of France (Contrôlleur Général des Finances) in 1720. Furthermore, the person in question was not French but Scottish. Enter John Law, the man most Europeans would have liked to meet in early 1720. By the end of that year Law had to move quickly out of France and became the subject of vicious caricatures and lampoons by European engravers and writers. *Sic transit gloria mundi.*

For a period it appeared that Law had discovered the philosopher's stone. Instead of embroiling himself in the alchemist's art of using chemistry to discover the solution to producing gold, Law had stood alchemy on its head, boldly announcing that the era of intrinsically valuable gold and silver money was at an end. One cynical French observer remarked that there was no need for the Protestant Law to become a Catholic because he

Above: *Portrait of John Law, attributed to Alexis Belle.*

Opposite: *Mississippi System speculation engraving. 1720. Het Groote Tafereei der Dwaasheid*, or *The Great Mirror of Folly*, was a volume of satirical prints and poems published in Holland immediately following the financial crisis of 1720. This engraving depicts the speculation around Law's Mississippi System. Note the flag on the house on the left with a devil scattering seeds on the rue Quincampoix, the street in Paris where shares were traded.

already was intimately acquainted with the doctrine of transubstantiation—namely, the conversion of paper into money. For a brief but significant moment, Law had left France specieless, ushering in the new era of paper money and shares. It was all so modern. Fleetingly Law, with the wind in his sails, had convinced the French populace to confine its financial activities to a choice between paper money and shares. Such was the success of his system that Britain, so recently victorious in the War of the Spanish Succession against France and confident that the legacy of Louis XIV's war debts would fetter France's economic development for many years, had to imitate Law's system so as not to be left behind in the new approach to macroeconomic management that Law had introduced into France. The growing prosperity of France in 1720 convinced the British authorities that they would have to follow suit and use the South Sea Company as the chosen vehicle to convert the British national debt. This apparent success of the Mississippi System led in turn to the birth of the South Sea Bubble, and Europe faced not just one but two major stock market booms.

Against the background of this feverish period of innovation it could be argued that Law was a shooting star imitating many of the ideas that had already been presented in pamphlets by a variety of projectors. There was, for example, nothing very original about the land bank proposal that he presented both to the British administration and the Scottish Parliament. Writers such as Briscoe, Cary, and, in particular, Hugh Chamberien, had already put forward ideas for land banks.[1] It could also be argued that the bank Law created, the General Bank, which would later become the Royal Bank, was a copy of the Bank of England and that the Mississippi Company was fashioned on the lines of the British trading companies such as the East India and South Sea Companies. Where was the originality in Law's ideas? In this chapter it will be contended that Law's originality lay in two main areas. The theoretical structure and vision that he embedded in his proposals was far in advance of anything that contemporary writers or pamphleteers provided. Moreover, Law had the genius to implement his ideas in a series of interlocking moves that led to the ultimate creation of a massive financial conglomerate that for a short period appeared to solve France's dual crises, the monetary crisis and the financial crisis. The very fact that he was appointed the equivalent of prime minister in January 1720 shows the extent to which he was deemed to be a success. Thus, we can talk of Law the innovating theorist and the innovating policymaker.

The Innovating Theorist

At some stage in the early part of the new eighteenth century John Law had a Pauline conversion, metamorphosing from the rake and celebrated beau of late London seventeenth-century society to a serious monetary theorist. In his early career Law was known as a gambling dandy in London society. His mother had rescued him from gambling debts that he incurred. Then he killed another beau, Edmund Wilson, in a duel in Bloomsbury

De KERMIS-KRAAM, van de ACTIE-KNAAPEN, Schaft vreugde, en droefheid, onder 't Kaapen.

Verklaaring op de Print door PHILADELPHUS.

Bedrog dat zich, aarminnig toond
Schoon 't biezend Slangen nest haar kroond
Het hoofd zwerd lustigs den teem
Zy mend verwinste padden loon
In t kruypen maar ten barstens dik
En groot geworden in het slik
Van Franche poelen, daar de dood
In moordery en hongersnood
Woed in het bitterste gevaar
Steaks treft dit ook den Londenaar
Waar zaand het paddenspoy ten buit
Voor Goudmslokkers door de Zuidt
Een kanker en een pest in t Rijk
Verwyl die lucht uit Actie stinkt
Verrekken over zee en land
Heen vliegt en Holland siesht in brand
Nu aast de rotte eerst op die vlam
De pest ontsteekt tot Rotterdam

En vliegt door Schiedam en ter Gouw
Voert en Zuidholland heen hee rouw
En wild ook de Actiehandel meerd
By Zeeuw by Vries aan de Vlie boord
Vernoemt men best hier te Amsterdam
De konstige eetnaald wyst hoe gram
Het Hemelsche Gerecht zich toond
Haar t kwaad alteos zyn meester loond
Op de Actiemaaten zit vooraan
Held ondeugd met zyn Actie Maan
De steeden lachen in er vuist
Verwyl men Amfiels geldig lunst
En Heintiepk een zot die LAW
En Ies en loom en Actie staauw
Veel Actes uitwaakt nieuwe wind
Van agter uitblaast t volk verblind
Door Goudzucht greept en tiekt en rukt
De nulle briefjes yder plukt

En haalt er nu ten roof ten proot
Coints straat de Beurs van Quincampoix
In de uitroud zaaren maar hoe stout
t Gewelt is de Amstelsche Neront
Druyst al dat yucht ten noortwaard uit
Fluks vliegt en Rykdom Schat en buit
Als damp en vile rook daar heen
De Zedigheid toond aant gemeen
Dat alles haast zal zyn vedaan
En weer op de oude Voeten staan
Maar t gratauze aan t muiten vukt de kraam
Van de Actie venter als infaam
En voer den Anbachtsmans de dood
Om van de waas staat sid ontbloot
Van overzeesche Koepmanschap
Uit de Actiehandel zuyt men knap
de konst van zand tot vleesbaar nat
te Maalen en in Utrechts staat

De Scheepen over berg en Mot
te voeren heen te voren t goeren
Van ryke Aeems handtrue kaat
Tot dat men konas t kaatbal gaat
Weer opdwarl naar het Appeldam
De vrucht van t eerst geteelen glans
De trits van Steeden voer de Rees
Verfoeid de Roer en de Amstel
En word daar door een oproer te
Geplaatst in t Hollands staatsbestier
Tuyen verhoerd Heeren van Lugt
En hoord in de eerste Senaten dacht
Met Actiaald bewrat t Zon
Te klaar voor zotte Phaeton
Den ook te stout in zyn bestaan
Met sperten in den eerdaan
Schemel dat ons land vereed
Berust te voor een Wonder val
en de Zeld le Koepman Schap doch hier
Herblooye smeekt de Batavier.

Square. He was sentenced to death for murdering Wilson, though the English authorities connived in his escape from prison. Having avoided the gallows, Law became a fugitive from English justice and had to travel on the continent. There, using his mathematical skills, he learned to become the equivalent of a bookmaker, always ensuring that the odds were stacked heavily in his favor by acting as the banker in games such as faro. This transformation from gambler to bookmaker enabled him to make a fortune at gambling, but Law had greater aspirations on the banking front. Traveling through countries such as Italy and the Netherlands he was greatly impressed by the superior quality of their banking systems. Already the Anglo-Dutch connection, cemented by the arrival of William of Orange to the throne of England in 1688, had led to the establishment of the Bank of England. Law felt that there was room for further monetary innovation and suggested in his *Essay on a Land Bank*, written in 1704 but not published until 1994, the creation of a land bank in England. This proposal was directed to Lord Godolphin, who rejected it. Unabashed, Law traveled from the continent to Scotland, where he could circulate freely prior to the Act of Union. There he proposed a land bank to the Scottish Parliament and persuaded his aunt to have his proposal published as a book by her publishing company. This resulted in the publication of *Money and Trade Considered with a Proposal for Supplying the Nation with Money* in 1705.

Because of his perceived failure as a policymaker Law has been pilloried by most economists ranging from Richard Cantillon to Anne-Robert-Jacques Turgot to Adam Smith to Karl Marx and to Alfred Marshall. This is unfortunate, because both the *Essay* and *Money and Trade* show the presence of a fine analytical mind prepared to discuss eighteenth-century economic issues using the terminology of a modern writer. In these two works he notched up many firsts. He was the first to use the term *demand* consistently in economic discourse, and he was the first to combine it explicitly with *supply*—what he called quantity—to produce a theory of price behavior. Law was the first writer to present the water/diamonds paradox, later to be borrowed without acknowledgement by Adam Smith, in his attempt to determine the determinants of value. These were not trivial discoveries.

Developing from his supply and demand theory Law advanced to apply it to monetary theory. Initially in the *Essay*, and with increasing frequency in *Money and Trade*, he referred to the demand for money. This was the first introduction of this concept into monetary analysis. It was not just some catch phrase that Law had happened to stumble upon. He believed that the demand for money was "proportion'd to people, land or product."[2] Though the concept of gross national product had not emerged in economics at this time it is quite clear from reading Law that he believed there was something called the product of the nation and that the demand for money was functionally related to it:

$$Md = f(Y).$$

But why did Law wish to put such emphasis on the demand for money? He maintained that if the supply of money was out of line with the demand for money this had implications for the overall level of prices. In the *Essay* he showed that when the supply of money was greater or lesser than the demand for money, prices would change and have redistributive effects on creditors and debtors:

> Though Parliament could give money to the nation in as great a quantity as there was occasion for the Parliament could not justly know what sum would serve the

nation for the demand changes. If the quantity is less than the demand for it the landed man who owes money and has his rent paid in the product of the ground is wronged, for money being more valuable it will cost him a greater quantity of his goods to pay the debt he owes. If the quantity of money is greater than the demand for it the money'd man is wronged for money being less valuable £100 will not buy him the same quantity of goods £100 bought before.[3]

In *Money and Trade*, Law went on to show how an overall expansion in the European money supply due to an influx of precious metals from South America would have inflationary consequences throughout Europe:

If the money of any particular country should increase beyond the proportion that country bears to Europe; it would undervalue money there, or, according to the way of speaking, it would raise goods: But as money would be undervalued everywhere the same, or near to what it were there; it would be of great advantage to that country, though thereby money were less valuable: For that country would have the whole benefit of the greater quantity, and only bear a share of the lesser value, according to the proportion its money had to the money of Europe. When the Spaniards bring money or bullion into Europe, they lessen its value, but gain by bringing it; because they have the whole benefit of the greater quantity and only bear a share of the lesser value.[4]

In his restatement of the modern quantity theory Milton Friedman wrote that "the quantity theory is in the first instance a theory of the demand for money. It is not a theory of output, or of money income, or of the price level. Any statement about these variables requires combining the quantity theory with some specifications about the conditions of supply of money."[5] It is my contention that over two hundred and fifty years before Friedman enunciated this view John Law had put together the basic building blocks of the modern quantity theory of money through his conceptualization of the demand for money and his demonstration of how prices change when the demand for and supply of money are not in equilibrium.

While Law emphasized the inflation problem in the *Essay* and discussed it in *Money and Trade*, the main focus of the latter work was the link between money and output. The title of the work *Money and Trade* was revealing in that trade may be taken as a synonym for output. Law wished to show that there was a symbiotic relationship between money and trade (output), with the causality running from money to trade. Scotland and later France, he believed, were suffering from significant unemployment and underutilization of resources because both economies had a shortage of money. To show the beneficial effects of increasing the supply of money Law put forward the basics of the circular flow of income, a theory which his rival Richard Cantillon[6] would later develop and which would be put, still later, into diagrammatic format by Francois Quesnay in the *Tableau Economique*.

Law's desire to conceptualize the macroeconomic system as a circular flow of income process was motivated by his concern to show the primary role of monetary forces in the system. He did not subscribe to the later fashionable view that money is a veil. Rather, Law perceived money as an essential ingredient in both exchange and production. He believed that economies were excessively reliant on the vagaries of the metallic monetary system. Quite simply, Law wished to remove this reliance on metallic money and replace it with a credit-creating paper money system. Edgar Faure, in *La Banqueroute de Law*, hypothesized

that Law had some Freudian reaction to his father when titling the opening chapter of his book "The Enemy of Gold Born in a Goldsmith's House."[7] But this is to misunderstand Law and the activities of the goldsmiths. At the end of the seventeenth century, the goldsmiths had become embryonic bankers learning the skills of lending money to a multiple of the reserves deposited with them. In advocating paper money and credit creation, Law was following in the footsteps of his father. However, he wanted to go even further. Rather than having a gold-backed banking system Law believed that it was possible to remove gold and silver completely from the monetary system. Pithily, he argued in *Money and Trade* that money was not the value *for* which goods were exchanged but the value *by* which they were exchanged. In other words, there was no need to have an intrinsically valuable money in circulation. Furthermore, his concept of money did not stop with banknotes. From his earliest writings Law had put forward a view that there were other financial instruments besides banknotes that could be used as money. He had seen dealings in the coffee houses of Exchange Alley where the shares of the East India Company and the Bank of England had been used as money. Though these shares did not have a constant value through time they had a known value at the time of the transaction and could therefore be used as media of exchange to pay for commodities and assets:

> Money to be qualified for exchanging goods and for payments need not be certain in its value. If it have the other qualities it will be received in payments and goods will be exchanged by it. . . . If money was proposed, that, because of the uncertainty of its value, was not qualified to be the measure by which goods are valued, nor to be the value in which contracts are taken payable, yet, it might be qualified to exchange goods by and to make payments in which are the great uses of money.[8]

Law was interested in the media of exchange qualities of financial instruments and as early as 1704 was prepared to categorize the shares of the Bank of England and the East India Company as media-of-exchange money. This inclusion of shares is important. This visualization of a broad range of financial instruments that could be used as media of exchange—ranging from gold and silver to banknotes, bills of exchange, and shares of the bank and the large trading companies—later led him to consider the shares of the Mississippi Company as a type of money and, furthermore, to monetize these shares at a guaranteed price of 9,000 livres a share in the spring of 1720.

Notwithstanding the theoretical brilliance of *Money and Trade*—there were many other theoretical innovations, including the law of one price and the money-in-advance requirement in it—the Scottish Parliament turned down Law's "proposal for supplying the nation with money." Furthermore, when the Act of Union uniting Scotland and Britain was brought into force in 1707, Law had to flee back to the continent. He was still a fugitive from justice. Over the next ten years Law submitted many proposals to the French authorities for the establishment of a bank in France. These were turned down, and it was only on the death of Louis XIV in 1715 that the conditions changed, enabling Law to produce a financial revolution. The innovating theorist was to become an innovating policymaker.

The Innovating Policymaker

To understand the revolutionary nature of Law the policymaker it is necessary to present some of the financial background. When Louis XIV, the Sun King, died, France was in a

state of bankruptcy. Continuous warfare had left France short of money and facing a sizable state debt. Furthermore, the tax revenue collection system had been farmed out to the private sector, leaving the financiers (gens de finance), such as Samuel Bernard, Antoine Crozat, and the Pâris brothers, the veritable controllers of the financial system. They exerted control by managing the tax farms and lending money to the state. In effect, the state was heavily mortgaged to the financiers.[9]

The change of monarchs provided the opportunity for the state to hit back at the financiers. At such times in French history popular opinion felt that there was a need for a *saignée* (blood-letting) of the financiers who were regarded as *sangsues* (bloodsuckers). This led to the establishment of the Chamber of Justice (*Chambre de Justice*), whose objectives included punishing the financiers by confiscatng their ill-gotten gains, fining them, sending them to the galleys, imprisoning them, and even publicly executing them. This was, in theory, the work of the Chamber of Justice. In practice the big financiers bribed their way out of their difficulties and paid token fines. To the public it looked as if justice had been done, but in reality the Chamber of Justice was more an inconvenience than a problem for the financiers. However, its existence did mean that, crucially, for a couple of years, the financiers had to maintain a low profile. In the financial vacuum created by the Chamber of Justice's activities John Law was finally able to push through his ideas.

France in 1716 was different from Scotland in 1705. Though both countries, in Law's opinion, suffered from a shortage of money that had created unemployment and underutilization of resources, France had a further crisis—a financial crisis. Overborrowing had created a massive overhang of state debt along with high interest rates, as the state had to pay more for any securities it issued. Analysis of Law's writings between 1705 and 1716 indicates that Law increasingly realized that he needed to tackle both the monetary crisis and the financial crisis.[10] He would later write that if he had faced just the monetary crisis the solution would have been easy to implement, but that he needed to tackle both if France was move back to prosperity. Thus, while Law started modestly with the establishment of the General Bank in May 1716 he viewed this as only the first in a series of interlocking blocks that would ultimately lead to the creation of the Mississippi Company. The growing success of the General Bank enabled Law to address the second crisis, management of the national debt. A new radical plan was necessary to restructure France's financial situation. Law decided that the best way to accomplish this was to convert government debt into the equity of a huge conglomerate trading company. To do so he needed to establish a trading company along the lines of British trading companies such as the East India Company and the South Sea Company.

The Chamber of Justice once again acted in his favor in that the financier Antoine Crozat, in partial payment of the tax exacted on him by the chamber, ceded his company's trading rights over Louisiana. In August 1717 Law took over the Company of the West (*Compagnie d'Occident*), which had been given monopoly trading rights over French Louisiana. The basis of this transaction involved the grant to the company of the trading rights to Louisiana, in return for which the company took over part of the state's short-term debt (*billets d'état*). The deal was advantageous to the crown in that part of the short-term debt was taken off the market and the rate of interest on it was lowered—this reduced rate of interest would also constitute the revenue stream for the company to finance its activities in Louisiana. Thus, for the crown, it represented a way to reduce the interest burden of the state as well as to fund it. From the company's viewpoint it received the exclusive privilege of developing French Louisiana, a territory far larger than

the current state of Louisiana. French Louisiana stretched from the Gulf of Mexico to Canada. It was bounded on the east by the British Carolinas and on the west by Spanish Texas. As such, it constituted half of the land mass of the United States today (excluding Alaska). Law hoped that by developing the agricultural and mineral wealth of this massive area the company would establish a heavy income stream to increase the dividend payments on its shares. To subscribe, transactors handed over their short-term government debt in return for shares of the company. These first shares were called mothers (*méres*). Because of the deep discount—around 70 percent—on government debt in the market, transactors were able to purchase shares with a nominal value of 500 livres by parting with government securities that had a market value of around 150 livres.

The Company of the West represented a modest financial building block for the creation of what later came to be known as the Mississippi Company. The income stream from the converted debt was small relative to the financing needs for developing French Louisiana, and the shares were quoted at a sizable discount to the nominal price for over a year from its establishment. Indeed, for more than eighteen months, the shares, though rising, remained quoted at below the par price of 500 livres.

Law's initial emphasis appeared to be one of growing the company by taking over the other trading companies and profitable monopoly ventures. In August 1718 the company acquired the lease of a tobacco farm. In December it took over the Company of Senegal. In May and June of the following year the Company of the East Indies and the China Company were merged with the enlarged Company of the West. This new entity was then named the Company of the Indies (Compagnie des Indes). Another company, the Company of Africa was taken over later in June. This meant that the Company of the Indies, which will now be referred to as the Mississippi Company, had become a giant holding company owning all of the overseas trading companies.

The takeovers of these companies helped grow the size of the Mississippi Company, but Law was the first to recognize that such activity required financing. He then started using the General Bank as an instrument to facilitate his expansionist plans. On December 4, 1718, by virtue of the *Déclaration Du Roy pour convertir la Banque Générale en Banque Royale*, he succeeded in having the General Bank (*Banque Générale*) converted into the Royal Bank (*Banque Royale*). Private shareholders were bought out and the ownership of the bank reverted to the Crown. The crucial element in this conversion of the bank was the decision, under article vii of the *déclaration*, to grant to the king's Council the power to determine the bank's note issue. This meant that, other than the decisions of the king's Council, there was no constraint on the issue of banknotes. By this action France had moved to a fiduciary note issue, and a month later, on January 5, 1719, the first issue of the Royal Bank was sanctioned by the king's Council, permitting the creation of 36 million livres in banknotes. From this point on Law could use banknote issues of the Royal Bank to provide liquidity in the market for the purchase of shares. The links with the Mississippi Company were further developed through the conversion of the bank's holdings of the 6 million livres of *billets d'état* that had been subscribed by the original shareholders into shares of the company. Assuming this conversion was made, this meant that the bank owned 12,000 shares or 6 percent of the paid up capital of the company.

The company's acquisitions and merger activities of 1718–1719 required financing. Law arranged this through the issue of two tranches of shares known as the *filles* and *petites filles*. It has already been shown that the *mères*, issued in 1717 on the establishment of the Company of the West, were subscribed for in *billets d'état*, which were standing at a

sizable discount. Effectively they had cost around 150 livres in 1717, though issued at a nominal price of 500 livres. The second issue of shares, the *filles*, was issued in June 1719 at 550 livres, a 50 livres premium suggesting wider public interest in the shares after an interval of nearly two years. The share price jumped in July, enabling Law to issue an additional batch of shares, the *petites filles*, this time at 1,000 livres each. Thus, for those who had bought the shares initially with the discounted *billets d'état* at a price of around 150 livres, considerable capital gains had been made. For those who stayed with the shares there were even greater gains to be made.

By the end of July 1719, the company had issued 300,000 shares with a nominal value of 150 million livres, which would have cost transactors, assuming the 70 percent discount on *billets d'état*, around 108 million livres. The share price, which jumped from 500 to more than 1,000 in July 1719, set the stage for a sharp increase in Europe's first major stock market boom. This boom was linked to Law's wish to take over the totality of France's national debt by swapping shares for government securities. The sheer magnitude of this operation proved to be breathtaking.

On August 26, 1719, the regent presented Law's proposal for the Mississippi Company to take over the tax farms and the remainder of the national debt. Writing in his diary, the Due d'Antin noted that this project had been under consideration by the regent for a "long time." It was not a sudden flash of inspiration by Law but represented a crucial part of a long thought strategy.

This was corroborated by the author of the "Histoire des Finances" who must have been a member of Law's inner circle and who later commented that despite the success of Law's operations up to the middle of July 1719 they had not cured the most "profound wounds" of the state, adding "What had been seen so far was more in the form of a preparation for the cure than a radical cure."[11] Later he remarked: "The object of the System did not stop with the establishment of a moderate credit . . . this would have sufficed in a state with a small debt burden."[12]

A far more ambitious plan was needed. Law's plan was to lend the king 1.2 billion livres at an interest rate of 3 percent so as to repay the outstanding national debt. This money was to be used to repay the long-term state debts, the annuities (*rentes*), the remaining short-term floating debt (*billets d'état*), the cost of offices (*charges*) that had been or would be suppressed, and the shares of the tax farms. There were two main elements in Law's proposals. First, the Company was given the right to borrow the 1.2 billion livres by creating shares. Second, the lease of the tax farms which had been granted to a company fronted by Aymard Lambert, a strawman for the Pâris brothers, for six years on August 29, 1718, was to be annulled and given to Law's company for a period of nine years. In this way Law deprived the financiers of the use of the United Tax Farms and in the process took over the joint stock company that they had created to manage it.

Under the plan, holders of government securities were encouraged to give them up, and at the same time were offered the possibility of acquiring shares of the company that yielded a lower dividend but offered the prospect of sizable capital gains. With the share price jumping from 2,250 on August 1 to 2,940 on August 14 to 5,000 and greater in mid-September, capital gains rather than dividends occupied the minds of most transactors.

Through these measures Law proposed "the radical cure" for the French economy. He aimed to transform the company from a trading company to a trading-cum-financial conglomerate, controlling the state's finances, most notably tax collection and debt management. Nicholas Du Tot said of this measure:

> This was a project which was sizable, elegant, and advantageous to the King and the people: but its principals were diametrically contrary to those of the old financial administration, so that its implementation was bound to encounter opposition.[13]

On August 1 the original shares, the *mères*, which could have been bought for around 150 livres in 1717, stood at 2,750 livres. By August 30 they had risen to 4,100 and by September 4 they reached 5,000 livres, with the *filles* and *petites filles* rising *pari-passu*. The debt holders who recognized the prospect of a capital gain were quite happy to transfer their debt into shares rather than bonds. They needed such a prospect to compensate for the interest reduction on their securities from 4 percent to 3 percent. Their difficulty, in fact, became one of ensuring quick convertibility into the shares of the company as the price of the shares rose very sharply during September.

On September 13 the company announced a fourth issue of 100,000 shares, with a nominal value of 500 livres, costing 5,000 livres per share, to be paid in ten monthly installments of 500 livres per month. By this issue the company aimed to raise 500 million livres from the public. Two further issues of these shares raising the same amount were made on September 28 and October 2, along with a smaller issue of just 24,000 shares on October 4—this latter issue was never actually sold to the public. Thus, within a three-week period the company issued 324,000 shares, of which 300,000 were sold to the public at 5,000 livres a share, amounting in all to 1.5 billion livres. The company had now started to operate in a manner different from that characterizing its operations between August 1717 and August 1719, when it had raised around 106 million through the first three share issues.

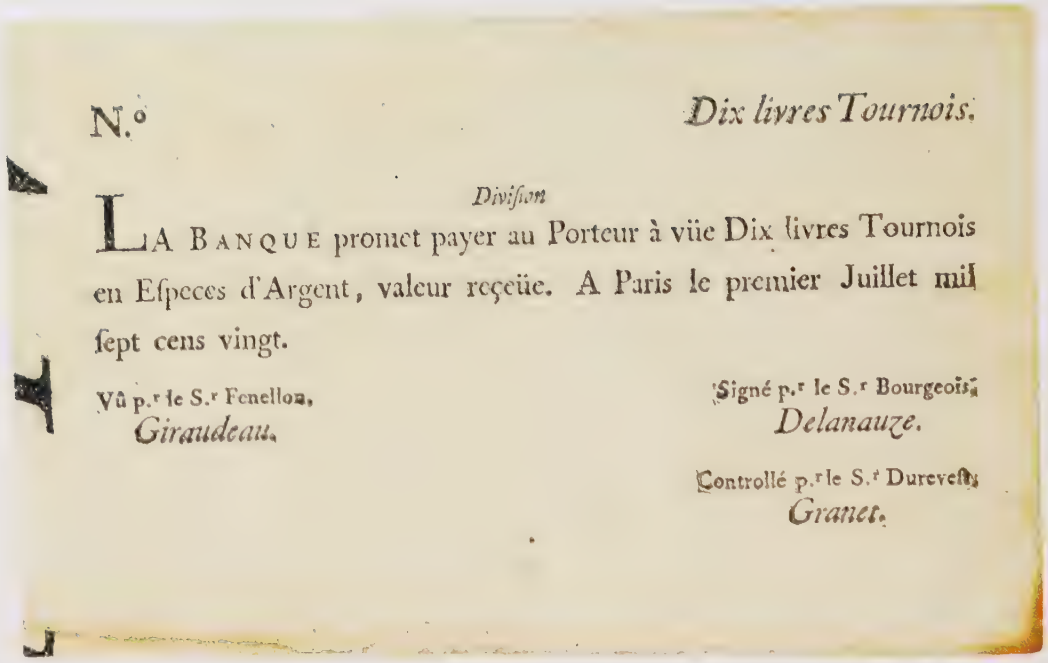
The four share issues of September and October 1719 were seventeen times greater in value than the first three share issues. This amount was never fully raised. Purchasers of the September and October issues, the *cinq-cents* as they were called, had only to put up 500 livres as an initial deposit for the shares and then repay the rest in nine monthly installments. Payment by installment was one of Law's favorite marketing ploys to increase the marketability of the shares to the general populace. Other marketing techniques included making the shares bearer securities, thereby providing anonymity of ownership. Even when the maturing monthly payment dates caused potential repayment problems for investors, and perhaps more importantly for the price of shares, Law softened the repayment terms by extending them from monthly to quarterly repayments. Small down payments and an ever increasing demand for shares pushed the price of fully paid shares to over 9,000 livres in the autumn of 1719.

The shares hit a high for 1719 of 10,000 livres on December 2. At this point the market valuation of the Mississippi Company was 6.24 billion livres. Concomitant with these developments the banknote issue of the Royal Bank had been increased from 160 million livres in June to 1 billion livres by the end of 1719, as money was lent to existing shareholders to purchase further shares. It looked as if the goddess of fortune was smiling benignly on France.

France was awash with liquidity, particularly after the company guaranteed a floor price of 9,000 livres a share in early 1720 through the establishment of a buying and selling agency known as the *bureau d'achat et de vente*. Effectively, the workings of this agency monetized the shares. Share dealings in the *rue Quincampoix* were now reaching a frenzied level. Indeed, a week after Law's appointment as Contrôlleur Général des Finances, the market went into another striking phase of speculative behavior. Law had been worried by the emergence of private derivative markets in the company's shares.

Engraved scene satirizing the share speculation of 1720. From *Het Groote Tafereel der Dwaasheid.*

Dealers on the *rue Quincampoix* had been offering options and futures contracts on the shares of the Mississippi Company. Law decided to rid the market of these private transactions by creating the company's own options which were called *les primes*. The *primes*, priced at 1,000 livres, offered transactors the possibility of having an option to purchase a share for 10,000 livres at a future date. Transactors rushed to sell their old shares and purchase the primes believing that this gave them greater leverage to make future gains out of the Mississippi Company. For example, by selling one share at 10,000 livres the transactor could acquire ten options entitling him or her to the equivalent of 100,000 livres of Mississippi stock. The *primes*, initially issued in a handwritten format, became the major financial instruments traded on the *rue Quincampoix*. Everyone now wanted to purchase them and within two days of their issue they were quoted at an 80 percent premium. Law must have been horrified that the market had misinterpreted his signals with respect to the *primes*. He used them to dampen down speculation on the future price of the shares and to convince the market that the price would not go above 10,000 livres. Transactors misinterpreted the signal and believed that this was another opportunity to make further gains on the shares. Law quickly restored order to this market by having the *primes* printed, thereby ensuring that there was enough issued to meet demand. The sizable premium on the *primes* quickly disappeared.



N.° *Dix livres Tournois.*

Diviſion

LA BANQUE promet payer au Porteur à vüe Dix livres Tournois en Eſpeces d'Argent, valeur reçeüe. A Paris le premier Juillet mil ſept cens vingt.

Vû p.r le S.r Fenellon,
Giraudeau.

Signé p.r le S.r Bourgeois,
Delanauze.

Controllé p.r le S.r Dureveſt,
Granet.

Printed and numbered banknote for 10 *livres tournois* issued by the Royal Bank on June 1, 1720.

At this juncture Law, who had been appointed Contrôlleur Général des Finances, in January 1720, wrote: "One sees here a sequence of ideas which are interlinked and which reveal more and more the principle on which they are based."[14]

The system, in all its unifying beauty, appeared to be working. Law was omnipresent, issuing daily instructions for the management of the companies within the huge holding conglomerate that he had put together. He even produced the equivalent of a management control chart with a breakdown of the day-to-day management meetings for each of the companies and the executive directors who were to attend.

An engraving on the front of a document listing the directors of all his companies (*Departements de Messieurs les Directeurs de la Compagnie des Indes*) gives a vignette of Law's vision of economic activity. It shows a windmill on the left providing water power. To the right one sees a river with goods-laden boats that are supplying horse-drawn carts that enter a town. This is a transport and communication chain bringing goods from the colonies and the French ports to cities such as Paris.

In the early months of 1720 Law appeared to have realized this vision. Economic activity was booming, the national debt seemed to be under control, money was plentiful, and the interest rate had been driven down to 2 percent. The *rue Quincampoix*, a long, narrow, and sinuous street, was the center of trading in the company's shares. Such was the frenetic activity in street trading that people barely had room to move, and the hump of a hunchback was frequently used as a type of table on which to write out contracts. Goaded by the success of Law's system, the British quickly introduced a variant when the South Sea Company's proposal to take over most of the government debt was accepted by the government. Unfortunately for Law, there were significant flaws in the Mississippi system, flaws that Richard Cantillon was quick to notice and exploit.[15]

Law had created a financial system in which the long-term viability crucially depended on the growth of the real economy. There had to be some equilibrium between the financial system and the real economy. Briefly, a temporary equilibrium existed as transactors seemed content to remain within the financial circuit, trading money for shares and shares

LAW, als een tweede Don-Quichot, op Sanches Graauwtje zit ten spot.
Dulcinia en 't Actie Roth,
Verzoekt den Lawen Don-Quichot,
Op Sanches Eseltje gezeeten,
(Wyl Rosinant wat hooy gaat vreeten)
In't groot betoovert Actie-huis.
En Sanche, tot zyn droevig kruis
Moet voor Bombario hier speelen;
Het kan den bloed te zeer verveelen;
Hy kruipt zyn baas na als een pad.
En Heintjemaat te drommels plat
Weet vast een ider te bespotten,
Daar een Zot maakt veel duizent Zotten

Engraved scene comparing John Law to Don Quixote. From *Het Groote Tafereel der Dwaasheid.*

for money. However, problems arose once money started quickly spilling out of the financial circuit into the real economy, problems that were exacerbated by the increasing interdependence between the bank and the company. The linkage between the bank and the company had been growing, for the banknotes of the Royal Bank, printed in increasing quantities, were used as a prop to maintain the share price. In February 1720 the Royal Bank and the Mississippi Company were formally merged. The real economy was unable to produce a sufficient growth in commodities to match the monetary expansion, so the excess money created inflation and balance of payments problems. Law had always believed that the growth in the real economy, spurred on by monetary expansion, would be sufficient to mop up the newly created money. Indeed, he went further and argued in *Money and Trade* that monetary expansion would lead to a balance of payments surplus. For a period Law tried to lock transactors into the financial circuit by a series of measures ranging from prohibitions on the holding of more than 500 livres of specie or bullion, to the demonetization of gold and a phased monthly devaluation of silver. Temporarily these measures worked. But there was still too much liquidity in the system. On May 21, 1720, an *arrêt* was published stipulating that shares were to be reduced by four-ninths (from 9,000 to 5,000) and banknotes by half (e.g., a banknote worth 10,000 livres would be reduced to 5,000 livres) between May and December.

This was an attempt to reduce the liquidity of the system, thereby bringing the financial circuit back into line with the real economy. Despite this, due to public pressure, the May 21 *arrét* was revoked a couple of days later and the effect on confidence was so great that the system never recovered from it. Law's enemies, the financiers, were emboldened to openly criticize his policies. They realized that if Law succeeded then they would no longer be able to live in comfort off the financial system that they had created and he had replaced. They had every incentive to ensure that Law failed. The tide had turned against Law. The price of shares and banknotes fell continuously during the summer (ironically, at the same time the shares in the South Sea Company were rising rapidly) and autumn of 1720. Ultimately, Law was forced to flee the country, with the aid of the regent, in December. The engravers of the banknotes at the Royal Bank were displaced by engravers of satirical prints who delighted in showing parallels between the system and hot air, between Law and Don Quixote, and so forth.

Law never gave up the dream of returning to France to reintroduce a variant of the system. Indeed, he came very close to returning in 1723. After the death of the Abbé Dubois, France's foreign minister and a strong enemy of Law, the regent was keen to invite Law back to France. Unfortunately for Law, the regent died before he could return and the new regent, the Duc de Bourbon, who had become a friend of Law's enemies, the Pâris brothers, blocked his return.

With this possibility gone Law went to live in Venice. There he passed away his remaining years trading in paintings, and in the process building up an impressive collection of old masters, an inventory of which is in the Rijksarchief in Limburg which is housed in Maastricht. He died in Venice in 1729 leaving a rich legacy of writings on economic issues.

The writer Du Tot, who worked as a deputy treasurer of the Royal Bank in 1720, would later make the following comment on Law's system:

> In this state, this construction was admired by everyone in France and was the envy of our neighbours who were really alarmed by it. Its beauty even surpassed all the hopes that had been placed in it since it made people despise and refuse gold and silver. It was a type of miracle which posterity will not believe; however, it is evident that there was a period, of many months, when no one wanted them [gold and silver].[16]

Unlike many theorists, Law had been able to introduce many of his theoretical ideas as economic policies. He had been able to realize for a short period his dream of having paper rather than metallic money as the sole circulating medium.

14

The Invention of Inflation-Indexed Bonds in Early America

ROBERT J. SHILLER

The world's first known inflation-indexed bonds were issued by the Commonwealth of Massachusetts in 1780 during the Revolutionary War. They were issued to U. S. soldiers as deferred compensation for their service, and were called depreciation notes or soldiers' depreciation notes. While there are earlier examples of measures to compensate people for their money's loss of purchasing power, this appears to be the first time that a debt contract specified payments formally linked to a price index, and in this historic bond it was a consumer price index.[1]

This important invention came about when stark necessity spurred invention and practical people under pressure devised these bonds as an immediate expedient to deal with problems they must have regarded as of life-and-death importance. The long-term significance of such bonds, which would also be issued by other entities in much later and more normal times, came to be appreciated by scholars only decades, even centuries, later.

Those anonymous inventors in 1780 apparently did so without the help of any academic or theoretical literature on indexation. John Maynard Keynes is widely quoted as asserting that most economic innovations derive ultimately from some "academic scribblers."[2] But, in fact, in the case of indexed bonds, there was no academic precursor.

As of 1780, there appears to have been virtually no

mention in any scholarly literature of indexed bonds or even of the concept of indexation. Ninety years ago Wesleyan University Professor Willard Fisher sought an earlier reference to indexation and the best he could find was a statement by Adam Smith, in 1776, that seems at best to refer to the concept only obliquely, and dismissing it.[3] Histories of the theory of indexation often start with William Stanley Jevons, who wrote expansively in favor of indexed bonds and other indexed contracts in 1875. A much earlier if less eloquent reference, and apparently the first clear treatment of the concept of indexation, is from Joseph Lowe, in 1822. That was already forty-two years after the Massachusetts issuance of indexed bonds.

The conventional history of the formal creation of indexed bonds starts in the twentieth century. Professor Irving Fisher of Yale University was a lifelong advocate of inflation-indexed bonds, and the company he co-founded, Rand-Kardex Co., first issued inflation-indexed bonds in 1925. These are the first true inflation-indexed bonds that I have been able to discover since those of 1780, that is, the first bonds tied explicitly to an index of consumer prices and not just to a price of a single commodity.

There were no significant imitators of Fisher's bonds for some years, and he died in 1947 with little evidence that his campaign was a success. But, around that time, other inflation-related securities began to appear. Finland introduced indexed bonds in 1945, Israel and Iceland in 1955, Brazil in 1964, Chile in 1966, Colombia in 1967, Argentina in 1972, the United Kingdom in 1975, Australia in 1985, Mexico in 1989, Canada in 1991, Sweden in 1994, New Zealand in 1995, United States in 1997, and France, 1998, and Japan and Italy in 2004. Starting in 1925, the concept of indexed bonds disseminated over many decades due to the advocacy of Irving Fisher and others of his time.[4] This huge worldwide explosion of indexed bonds began 145 years after the first example was issued.

The 1780 Issue of Inflation-Indexed Bonds

Already by 1780, the state of Massachusetts had had longstanding problems with an unstable price level due to the state government's excessive printing of paper money. These problems had persisted for the better part of a century when the depreciation notes were issued. Inflation had been a deep-set problem that accounted for a lot of the problems of the state, and that had occupied a great deal of public attention over these years.

The problems started with the Massachusetts government's attempt to pay for an unsuccessful 1690 invasion of Quebec during King William's War (1689–1697). Unable to pay its soldiers immediately, the state government resorted to printing paper money that it promised to redeem later. These were bearer notes, so many or most of the soldiers spent them immediately, and the notes entered circulation as a form of paper money. Since they were not immediately redeemable in specie they sold at a discount, a discount that varied over time not only due to changes in discount rates but also due to changes in public perceptions of the likelihood that they would eventually be paid in specie.[5]

Further, such notes were issued to soldiers during Queen Anne's War (1702–1713). Massachusetts issued more paper money than it could reasonably be expected to repay. Printing of money continued and public faith in the paper declined—it then sold at a substantial discount from sterling for many years.

Already by 1743, the governor of Massachusetts William B. Shirley (1694–1771) wrote of these problems in a report to the Board of Trade, that in the last thirty years the currency had "gradually sunk in their value from forty to four hundred forty percent below

sterling money." Since a 1712 law had made the local currency legal tender at face value for all debts, he noted that losses were incurred by "creditors of all kinds who had had dealings with the people of New England, and had not been cautious enough to ascertain the value of their debts, by special contracts for the payment of 'em, either in sterling or proclamation money."[6]

The intellectual environment in New England had apparently prepared the way for this innovation, and evidence of this environment can be found as early as 1742 in Massachusetts legislation that specified that, in times of highly depreciated currency, court judgments should take account of the depreciation as calculated using the exchange rate between a new local currency, later called equity bills, and the British pound sterling. Similar legislation was enacted around that time in Connecticut, New Hampshire, and Rhode Island. This legislation established a precedent for acknowledging the effects of a currency depreciation.

The costs of King George's War (1744–1748) threatened to destroy the value of the large amount of currency issued by Massachusetts to pay for the war. A further crisis was avoided when Britain, in whose behalf Massachusetts had fought the war, shipped over enough solid coin to redeem the new currency.

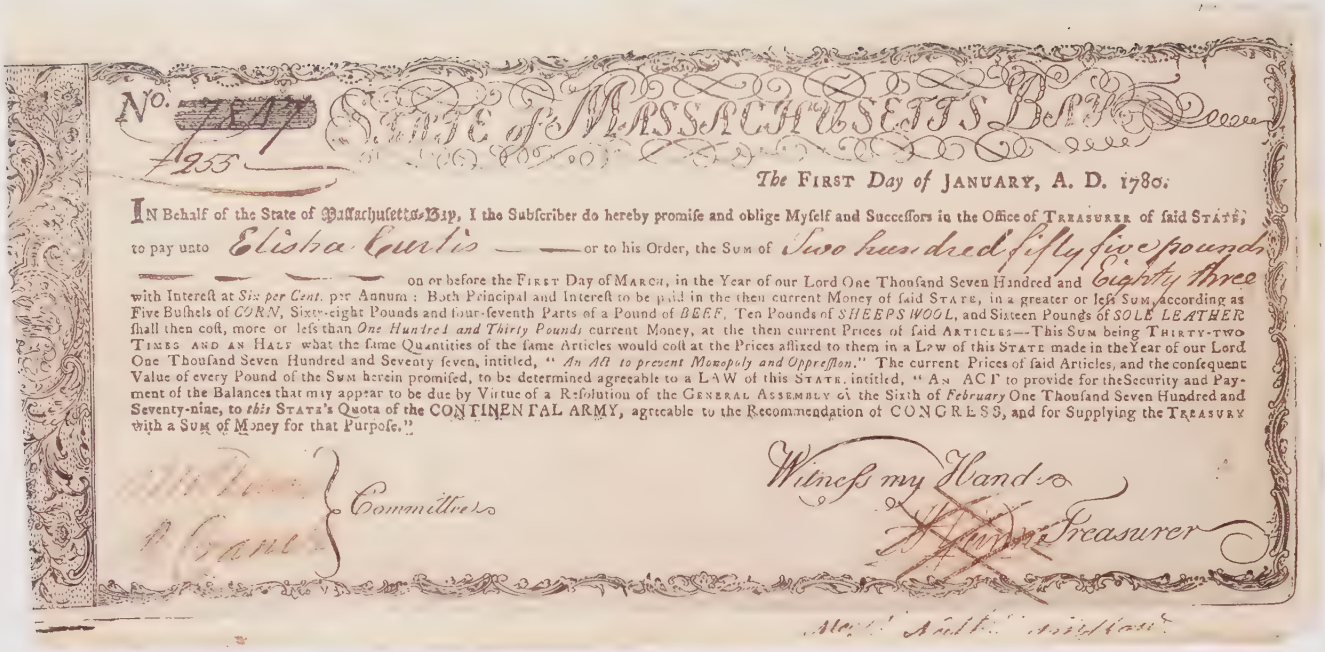
Problems reappeared when the state of Massachusetts once again issued paper money to pay for its part in the Revolutionary War. Once again, the state government could not raise enough money through taxes, and once again the soldiers were paid in bearer notes that they were obliged to sell immediately at a substantial discount. The wartime inflation meant that soldier's pay was losing much of its value between the time promised and actually received, and by the time the soldiers were able to spend it or send it to their families. The soldiers had been paid only nominally but had been cheated by inflation out of their real pay, a situation that strongly discouraged their willingness to serve their country further.

A 1777 Massachusetts act called "An Act to Prevent Monopoly and Oppression" attempted to deal with inflation by fixing prices. The act listed prices measured in Massachusetts pounds for fifty commodities in Boston, to allow government price-fixing to forestall wartime inflation. The policy was disastrous; it substantially shut down the market for these basic necessities and was quickly abandoned. Another expedient was clearly necessary to assure just compensation to soldiers.

By the late 1770s, when these first inflation-indexed bonds were conceived and designed, the U. S. War of Independence was in a difficult stage. In 1779, the British Army had just captured the state of Georgia and had taken Charleston, South Carolina. The eastern seaboard of the United States was blocked by the British Navy. The morale of the U. S. Army was low: they were poorly fed, poorly clothed, and often sick. The morale was so low that, as we now know, there were actual army mutinies in 1780 and 1781. There was real concern in 1779 that it would be impossible to keep an army if something were not done to address their pay's loss of value. The invention of indexed bonds came in response to this very real and dangerous crisis.

The U.S. Congress issued a letter in 1779 to be read by ministers from the pulpit, that detailed the problem:

> The present situation of public affairs demands your most serious attention, and, particularly, the great and increasing depreciation of your currency requires the immediate and strenuous and united efforts of all true friends to their country, for preventing an extension of the mischiefs that have already flowed from that source. . . .



No. 7847 STATE of MASSACHUSETTS BAY

£255

The FIRST Day of JANUARY, A. D. 1780.

IN Behalf of the State of Massachusetts-Bay, I the Subscriber do hereby promise and oblige Myself and Successors in the Office of TREASURER of said STATE, to pay unto Elisha Curtis — or to his Order, the SUM of Two hundred fifty five pounds — on or before the FIRST Day of MARCH, in the Year of our Lord One Thousand Seven Hundred and Eighty three with Interest at *Six per Cent.* per Annum: Both Principal and Interest to be paid in the then current Money of said STATE, in a greater or less SUM, according as Five Bushels of *CORN*, Sixty-eight Pounds and four-seventh Parts of a Pound of *BEEF*, Ten Pounds of *SHEEPS WOOL*, and Sixteen Pounds of *SOLE LEATHER* shall then cost, more or less than *One Hundred and Thirty Pounds* current Money, at the then current Prices of said ARTICLES—This SUM being THIRTY-TWO TIMES AND AN HALF what the same Quantities of the same Articles would cost at the Prices affixed to them in a LAW of this STATE made in the Year of our Lord One Thousand Seven Hundred and Seventy seven, intitled, "*An Act to prevent Monopoly and Oppression.*" The current Prices of said Articles, and the consequent Value of every Pound of the SUM herein promised, to be determined agreeable to a LAW of this STATE, intitled, "AN ACT to provide for the Security and Payment of the Balances that may appear to be due by Virtue of a Resolution of the GENERAL ASSEMBLY of the Sixth of *February* One Thousand Seven Hundred and Seventy-nine, to *this* STATE's Quota of the CONTINENTAL ARMY, agreeable to the Recommendation of CONGRESS, and for Supplying the TREASURY with a SUM of Money for that Purpose."

Committee

Witness my Hand

Treasurer

Indexed bond issued by the State of Massachusetts Bay, January 1, 1780. Commodity-linked bond, to pay "unto Elisha Curtis, or his Order, the Sum of Two hundred fifty five pounds on or before the First Day of March, in the Year of our Lord One Thousand Seven Hundred and Eighty three."

> Our enemies prosecuting the war by sea and land with implacable fury and with some success, taxation at home and borrowing abroad, in the midst of difficulties and dangers, were alike impracticable. Hence, the continued necessity of new emissions.[7]

The monetary situation was therefore an inevitable consequence of the precarious national situation, its resolution an inherent aspect of the national defense, and as their patriotic duty Congress called upon the states to assure that their soldiers were fairly compensated. The Massachusetts legislature passed a resolution on February 6, 1779, to give just settlement of the soldiers' claims, and committees were established that would propose adjustments. The work of these committees led then to the creation of the indexed bonds.

The depreciation bonds were created in Massachusetts by "An Act to provide for the Security and Payment of the Balances that may appear to be due by Virtue of a Resolution of the General Assembly of the sixth of February, One Thousand Seven Hundred and Seventy-nine, to this States Quota of the Continental Army, agreeable to the Recommendation of Congress, and for Supplying the Treasury with a Sum of Money for that Purpose," January 13, 1780. The act was part of an effort to substantiate the promise of the 1777 act, which had failed to fix prices. Unable to fix prices, the government of Massachusetts did the next best thing, to provide enough income to their soldiers so that they could buy the basket of goods defined by a subset of the list of goods in the 1777 act as if they still had their specified prices. Perhaps due to the difficulties of collecting price data, the indexed bonds were based on only four of the fifty commodities described in the 1777 act.

We can read from these engraved bonds themselves (and surrounded by a border apparently in the hand of the official engraver for Massachusetts, Paul Revere) the terms of the indexation. An example of these bonds, dated January 1, 1780, states:

> Both Principal and Interest to be paid in the then current Money of said STATE, in a greater or less SUM, according as Five Bushels of CORN, Sixty-eight Pounds and

TABLE OF DEPRECIATION.

Date.	Beef stated in the Monopoly Bill at 4*d* and 3*d* is 3½*d* per pound. Current Price Monthly.	Rate of Depreciation.	Indian corn stated in the Monopoly Bill at 4*s* per bushel. Current Price Monthly.	Rate of Depreciation.	Wool stated at 2*s* per pound in said Bill. Current Price Monthly.	Rate of Depreciation.	Sole Leather stated at 1*s* 3*d* per pound. Current Price Monthly.	Rate of Depreciation.	Mean rate of Depreciation.
1777. January.	4*d*	1.142 for 1	4*s*	1. for 1	3*s*	1.50 for 1	1*s* 3*d*	1. for 1	1.16 for 1
February.	4*d*	1.142	4*s*	1.	2*s*	1.	1*s* 3*d*	1.	1.03
March.	4*d*	1.142	4*s*	1.	2*s*	1.	1*s* 3*d*	1.	1.03
April.	4*d*	1.142	4*s*	1.	4*s*	2.	1*s* 3*d*	1.	1.28
May.	8*d*	2.284	4*s*	1.	4*s*	2.	1*s* 3*d*	1.	1.57
June.	8*d*	2.284	6*s*	1.50	4*s*	2.	1*s* 3*d*	1.	1.60
July.	8*d*	2.284	8*s*	2.	4*s*	2.	1*s* 3*d*	1.	1.82
August.	8*d*	2.284	10*s*	2.50	5*s*	2.50	2*s* 10*d*	2.25	2.38
September.	8*d*	2.284	12*s*	3.	5*s*	2.50	2*s* 10*d*	2.25	2.50
October.	8*d*	2.284	12*s*	3.	12*s*	6.	5*s*	4.	3.82
November.	8*d*	2.284	12*s*	3.	12*s*	6.	5*s*	4.	3.82
December.	10*d*	2.857	16*s*	4.	12*s*	6.	5*s* 7½*d*	4.50	4.34
1778. January.	10½*d*	3.	18*s*	4.50	12*s*	6.	5*s* 7½*d*	4.50	4.50
February.	12½*d*	3.580	18*s*	4.50	12*s*	6.	5*s* 7½*d*	4.50	4.64
March.	13*d*	3.714	20*s*	5.	12*s*	6.	5*s* 7½*d*	4.50	4.80
April.	15*d*	4.285	24*s*	6.	12*s*	6.	5*s* 7½*d*	4.50	5.19
May.	16½*d*	4.714	32*s*	8.	12*s*	6.	5*s* 7½*d*	4.50	5.80
June.	18*d*	5.142	32*s*	8.	12*s*	6.	5*s* 7½*d*	4.50	5.91
July.	17*d*	4.857	40*s*	10.	12*s*	6.	5*s* 7½*d*	4.50	6.34
August.	16½*d*	4.714	40*s*	10.	12*s*	6.	5*s* 7½*d*	4.50	6.30
September.	17*d*	4.857	40*s*	10.	12*s*	6.	8*s* 5½*d*	6.75	6.90
October.	17*d*	4.857	40*s*	10.	12*s*	6.	8*s* 5½*d*	6.75	6.90
November.	18*d*	5.142	40*s*	10.	12*s*	6.	8*s* 5½*d*	6.75	6.97
December.	18*d*	5.142	48*s*	12.	12*s*	6.	8*s* 5½*d*	6.75	7.47
1779. January.	1*s* 10*d*	6.285	£2 12*s*	13.	15*s*	7.50	8*s* 5½*d*	6.75	8.38
February.	2*s* 2*d*	6.857	£2 16*s*	14.	15*s*	7.50	11*s* 3*d*	9.	9.34
March.	3*s* 6*d*	12.	£3	15.	15*s*	7.50	11*s* 3*d*	9.	10.87
April.	4*s* 6*d*	15.428	£3 4*s*	16.	18*s*	9.	11*s* 3*d*	9.	12.35
May.	6*s*	20.571	£3 12*s*	18.	18*s*	9.	11*s* 3*d*	9.	14.14
June.	6*s*	20.571	£4	20.	20*s*	10.	16*s* 10½*d*	13.50	16.02
July.	6*s* 6*d*	22.285	£3	40.	30*s*	15.	16*s* 3*d*	13.	22.57
August.	6*s* 6*d*	22.285	£6	30.	22*s* 6*d*	11.25	22*s* 6*d*	18.	20.38
September.	6*s*	20.571	£4 10*s*	22.50	22*s* 6*d*	11.25	16*s* 10½*d*	13.50	16.95
October.	6*s*	20.571	£4 10*s*	22.50	24*s*	12.	16*s* 10½*d*	13.50	17.14
November.	6*s* 6*d*	22.285	£5	25.	42*s*	21.	33*s* 9*d*	27.	23.37
December.	7*s*	24.	£8	40.	60*s*	30.	33*s* 9*d*	27.	30.25
1780. January.	8*s* 9*d*	30.	£8	40.	60*s*	30.	37*s* 6*d*	30.	32.50

four-seventh Parts of a Pound of BEEF, Ten Pounds of SHEEPS WOOL, and Sixteen Pounds of SOLE LEATHER shall then cost, more or less than One Hundred and Thirty Pounds current money, at the then current Prices of said ARTICLES—This SUM being THIRTY-TWO TIMES AND AN HALF what the same Quantities of the same Articles would cost at the Prices affixed to them in the Law of this STATE made in the Year of our Lord One Thousand Seven Hundred and Seventy-seven, intitled, "An Act to prevent Monopoly and Oppression."

Table 14.1. *Table of Depreciation.* From Resolves of the General Assembly, January 13, 1780, "An Act to provide for the Security and Payment of the Balances that may appear to be due by Virtue of a Resolution of the General Assembly of the sixth of February, One Thousand Seven Hundred and Seventy-nine, to this States Quota of the Continental Army, agreeable to the Recommendation of Congress, and for Supplying the Treasury with a Sum of Money for that Purpose."

The paragraph defines a price index, specified in terms of fixed quantities of the articles. The index equaled 4.0 in 1777 and 130.0 in 1780, a 32.5-fold increase. Calculations were made of the amount owed to soldiers in light of this depreciation of their pay. The soldiers were then given in 1780, to settle their claims, the inflation-indexed bonds, divided into four equal parts. Those who enlisted for the rest of the war were given four notes maturing in 1781, 1782, 1783, and 1784. Others were paid in notes maturing in 1785, 1786, 1787, and 1788. A table from the act shows calculation of the index for 1777 to 1780 (see table 14.1).

The quantities used to define the index were apparently not based on any representative market basket. Certainly, it is far more likely that a family would consume five bushels of corn than sixteen pounds of sole leather in a year's time. The quantities were instead defined so that they represent equal currency values of the commodities in 1777. According to the 1777 act, "Good Indian meal or corn" cost 4 shillings a bushel, "good merchantable sheeps wool" 2 shillings a pound, "good well-fatted grass fed beef" 3 pence a

PRESIDENT LANGDON'S ACCOUNT

Debr

The State of Massachusset's Bay to Saml Langdon as President of Harvard College. Cr.

	£
To 1 Years Salary to Octor 14 1775	200. 0. 0
To 1 Year 2 Months & 17 Days Salr to Janr 1. 1777	242. 4. 5
To 1 Year Dr to Janr 1. 1778	200. –. –
To Dr .. .. Janr 1. 1779	200. –. –
To Dr .. .. Janr 1. 1780	200. –. –
To 8 Months & 13 Dr Dr to Septr 13 1780	140. 9. 1
	£1 182.13. 6
	685. 7.11
Ballance	497. 5. 7

Septr 11. 1780. Errors | excepted p Saml Langdon

			Value of 20/			
By Cash & Grants to Octor 14 1775			£200. . 20/ .is equal to			200. –. –
By Dr granted Febr 1. paid Febr 20 1777			242. 4.5.	19/5 ..	is	..235. 3. 2
By Dr Janr 22 paid Febr 2. 1778			200. 0.0.	4/3 ..	is	.. 40.16. 8
By Dr June 12 pd July 16 1778			200. 0.0.	3/2 ..	is	.. 31.13. 4
By Dr April 1 1 000	paid	April 1. 1779	123.18.0.	1/7 ..	is	.. 9.16. 2
		May 18.	180. 0.0.	1/5 ..	is	.. 12.15. 0
		June 19	696. 2.0.	1/3 ..	is	.. 42.13. 8
By Dr Janr 12. paid Febr 1. 1780			2 000. 0.0.	5 1/24.	is	.. 45.16. 8
By Dr May 4. paid May 11. 1780			5 000. 0.0.	3 1/4d.	is	.. 66.13. 4
						685. 7.11
						497. 5. 7
						1 182.13. 6

The above Computation is made by a Table of Depreciation prepared by a Committee of the General Court for settling the Pay of the Soldiers, as far as June 1779, For Febr & May 1780 it is continued on the same Principles.

Table 14.2 Account of indexation adjustments to the compensation for Samuel Langdon, president of Harvard College, 1780. From Allan C. Fisher, "The Tabular Standard in Massachusetts History," *The Quarterly Journal of Economics* 27, no. 3 (May, 1913): 454.

pound, "stall fed beef, well fatted" 4 pence a pound, and "tanned hides" 1 shilling 3 pence a pound. The quantities specified on the bond all cost £1 at these prices (where the two beef prices are averaged to be 3.5 pence a pound). This index is neither Laspeyres or Pasche, but might be roughly justified in terms of a model which asserts that the price change of each commodity equals an underlying inflation rate plus a noise term, that is, measured as a fraction of base year price, independent across commodities and identically distributed.[8]

Once in place, the indexation implicit in the Massachusetts indexed bonds led to at least one other application: to index the pay of the president of Harvard College, Samuel Langdon. The account (see table 14.2) shows the pay that President Langdon received from 1774 to 1780 according to his promised rate of pay of £200 per annum, along with the real value, in January 1775 prices, of these payments and some other, much larger, payments that were made to him in 1780, apparently in an effort to compensate him for the real value of his pay lost to inflation. The account converts all these payments to 1775 prices and sums them. The difference between this sum and the sum of the actual payments is the amount owed to President Langdon in January 1775 prices. This is an early, perhaps the first, cost of living allowance in a civilian labor contract.

The invention of indexed bonds, and of indexation more generally, in 1780 was a bright spot in the history of financial innovation. But, unfortunately, it did not stick. The notes were soon replaced. A 1782 act provided for the eventual consolidation of the state debt and the replacement of the depreciation notes with new specie securities. The consolidation was complete by 1786, two years before the maturity of the longest-dated notes issued in 1780. In 1786 an act stipulated that "it is altogether unnecessary that the Committee, or Agents, appointed for the collecting and ascertaining the value of the several articles specified in the Notes issued for the pay of the late Continental Army, commonly called depreciation Notes, be any more contained in office."[9] The experiment with indexed bonds ended abruptly, and with no explanation.

Despite its abrupt end, the invention of indexation in Massachusetts in 1780 is an example of significant financial innovation. It helped solve some pressing problems facing a new nation, and did so in a logical and orderly way that could have been generalized to solve many other subsequent monetary problems.

The Role of Economic Theory in Promoting Indexation

It seems that necessity was the mother of this invention. The creation of indexed bonds in Massachusetts in 1780 appears to deny the importance of the "academic scribblers" that Keynes extolled, for the invention appeared long before the scholars wrote about it. And yet, in another sense, it only reinforces their importance, for the practice of indexation of bonds did not take hold at that time. It is a reasonable supposition that the indexed bonds did not continue because there was no well-conceived model that would justify and explain them.

Since the indexation was proposed in 1780 as an expedient to deal with a most pressing temporary problem, there was no economic theory explaining its fundamental importance. When the Revolutionary War ended in 1783, there was thus no longer a perceived need for these bonds. Collecting data and computing a price index consumes resources, and if inflation is no longer a pressing and immediate issue then indexation might plausibly be dropped. The price index used was very crude, and its defects might be seen to outweigh its advantages in a time of relatively stable prices. In fact, however, the history of the United States in the nineteenth century reveals considerable instability of prices, and so it would have been better if the indexation *had* continued.

The failure to pursue the idea of indexation after 1780 may also be due to some of the problems of index number theory that were only intuitively grasped at the time. In the twentieth century, index number theorists realized that there is a substantial problem with a simple index such as that used in Massachusetts in 1780. If one of the commodities used to define the index becomes scarce, a shortage of it develops, and the price of that commodity might jump very high. Consumers would normally substitute for another commodity, and thus would not need as much money as indicated by the price index to maintain their standard of living. The price index would then jump sharply and become unrepresentative of the increase in the true cost of living. If bondholders were paid the amount specified in the index formula they would enjoy a windfall, since they could switch their consumption to other commodities that were not in short supply. They would find that their purchasing power has been increased dramatically by the indexation. The bond issuers, on the other side of the transaction, were similarly affected but in the opposite direction.

Well into the twentieth century Irving Fisher proposed that the solution to this problem would be to tie indexed payments to a sort of price index that he called an ideal index. The Fisher ideal index has no predictable bias. Now, in the twenty-first century, there is clear recognition of the significance of an ideal index, and efforts are being made in many countries to bring measures of inflation closer to such an ideal. Thus, a technical problem with the original concept of indexed bonds was solved over many years of research in economic theory and no longer stands as a serious obstacle to their implementation.

Another reason that the indexed bonds of 1780 were not pursued after the war may have been the difficulties that a less educated population would have with index number calculations. Not only are people troubled by "math anxiety" when doing index calculations but they also have a difficulty with intuitive understanding of the indexation concept. If this is true today, then it is all the more likely to have been true in colonial America.

In 1997, I did a survey study of randomly selected people in the United States and Turkey to try to determine the reason for their relative lack of interest in indexed bonds. Turkey was included for comparison, since Turkey was a high inflation country then. I

first tried to find out whether the general public could understand the concept of indexation, even testing them with a simple arithmetic problem that related to the basic issues of indexation. More or less, people who agreed to answer the questionnaires in both countries seemed to be able to deal with the concept of indexation if challenged to do so.

Thus, there are certainly plenty of people around who are capable of understanding indexation. And yet, some of these same people would also say that they did not want the indexation. There appeared to be no logical explanation for this resistance. One of the respondents explained that "I want to know how much money I will be getting." Perhaps that statement best captures the basic sentiment. There seems to be a pattern of wanting money for its own sake and mistrusting mathematical formulas.

Perhaps this resistance to indexation is another reason that the 1780 indexation scheme did not catch on. The only example we have of private indexation inspired by the public indexation scheme implicit in the depreciation notes is the example of President Langdon of Harvard. Then, as now, only the intellectuals and academics, apparently, embraced indexation.

The example of Harvard President Langdon calls to mind an experience of mine of a few years ago. When I talked to a Treasury official in 1996 about possible plans for the issuance of U.S. indexed bonds, I was told that there was a joke at the U.S. Treasury Department that if and when the indexed bonds are one day issued, Treasury should send the prospectus to the membership roster of the American Economics Association, as these are the only people likely to be really interested. Of course, the indexed bonds issued in the United States did get off to a slow start, but now make up approximately 2 percent of the national debt. So, the modern demand for indexation has moved considerably beyond the economists, and the demand might well have extended far beyond President Langdon in the eighteenth century if other conditions had been right.

In the eighteenth century, as now, the concept of indexation must have been a difficult one, and the underlying economic theory beyond the intuitive ken of most people. Economists and financial theorists can understand the concept. But if indexation is to succeed, a public effort must be undertaken to teach its value to ordinary citizens. The world apparently was not ready for an extensive use of indexed bonds in the eighteenth century.

Appendix

Bonds that make interest payments in a specified commodity have a long history. A Confederate States of America loan of 1863 (below) is payable, at the pleasure of the government, either in specie or cotton. A bond issued by the state of Hesse in Germany in 1923 (next page) is payable in rye. In both examples, the bonds were issued after hyperinflation had soured the market for nominal bonds, and the commodity terms were necessary to find a market for government debt.

These bonds are, however, not indexed bonds, since they are not defined in terms of an index number of commodities. An index number, like the one defined in the Massachusetts Soldier's Depreciation Notes of 1780 (facsimile is on page 242), represents a measure of the purchasing power of money or the cost of living, rather than just the price of a single commodity.

Confederate States of America $1,000 loan. June 1, 1863. This twenty-year bond issued by the Confederate States promises to pay "the sum One Thousand Dollars plus interest at the rate of six percent per annum, at the pleasure of the Government, in Specie, or in Cotton of the quality of New Orleans Middling, valued at six pence sterling per pound, to be delivered at the pleasure of the Secretary of the Treasury at either of the Ports of New Orleans, Mobile, Savannah, Charleston, Wilmington, Richmond, or Norfolk, under such regulations as he may establish."

10 Zentner Roggen

Roggen-Anleihe

des Volksstaats Hessen

Abteilung 1

Buchstabe D

10 ZENTNER ROGGEN

Nr. 002152

5% Schuldverschreibung

über den Geldwert von 10 Zentner Roggen.

Der Volksstaat Hessen
schuldet dem Inhaber dieser Schuldverschreibung den Geldwert von

10 Zentner Roggen.

Für die Schuld samt Zinsen haftet das Land Hessen mit seinem gesamten Vermögen. Der Betrag für die Verzinsung und Tilgung ist aus den allgemeinen Staatseinkünften, insbesondere aus den auf [illegible]asis gestellten Einnahmen aus den Staatsdomänen bereitg[illegible] Die Anleihe wird mit 5 vom Hundert verzinst. In[illegible]eigen gelten die auf der Rückseite abgedruckten Bedingungen.

Hessische Staatsschuldenverwaltung

Darmstadt, 12. Dezember 1923.

Ausgefertigt:

Druck: L. C. Wittich, Darmstadt.

10 Zentner Roggen, 5 percent Schuldversschreibung. December 12, 1923. Bond issued by the State of Hesse, promising to pay 5 percent interest over the monetary value of 10 hundredweights of rye. The interest payments were linked to the price of rye during the month of May at the Frankfurt Commodity Exchange. The final repayment would be based on the rye prices during the three months prior to the redemption. In case the Frankfurt Exchange would cease to exit, quotations would be taken from Berlin.

15
The Origins of Mutual Funds

K. GEERT ROUWENHORST

Over the past two decades, mutual funds have become the primary investment for small investors. At the turn of the twenty-first century, the number of mutual funds in the United States exceeded the number of securities listed on the New York Stock Exchange.[1] Compared to direct investments in individual stocks and bonds, mutual funds offer the advantages of liquidity and diversification at a relatively low cost. While the popularity of mutual funds is relatively recent, the origins of mutual funds date back to the early days of organized stock trading.

The founding of the Foreign and Colonial Government Trust in 1868 marks the beginning of mutual funds in the Anglo-Saxon countries. However, by that time investment trusts had existed in Holland for almost a century. In 1774 the Dutch merchant and broker Abraham van Ketwich invited subscriptions from investors to form a trust named *Eendragt Maakt Magt*—the maxim of the Dutch Republic, "Unity Creates Strength." The founding of the trust followed the financial crisis of 1772–1773, and Van Ketwich's aim was to provide small investors with limited means an opportunity to diversify. Risk spreading was achieved by investing in Austria, Denmark, Germany, Spain, Sweden, Russia, and a variety of colonial plantations in Central and South America.

The first mutual fund originated in a capital market that was in many ways well developed and transparent.

More than one hundred different securities were regularly traded on the Amsterdam exchange, and the prices of the most liquid securities were made available to the general public through broker sheets and, at the end of the century, a price courant—a biweekly publication that in addition to security prices listed real estate transactions and announcements of dividends and security offerings.[2] The bulk of trade took place in bonds issued by the Dutch central and provincial governments and bonds issued by foreign governments that tapped the Dutch market. The governments of Austria, France, England, Russia, Sweden, and Spain all came to Amsterdam to take advantage of the relatively low interest rates. Shares were scarce, and the most liquid issues were the Dutch East India Company, the Dutch West India Company, the British East India Company, the Bank of England, and the South Sea Company. The other major category of securities consisted of plantation loans—or negotiaties,[3] as they were known in the Netherlands. Issued by merchant-financiers, these bonds were collateralized by mortgages to planters in the Dutch West Indies colonies Berbice, Essequebo, and Suriname.

Mutual funds emerged gradually, as merchants and brokers learned how to expand the range of investment opportunities to the general public during the eighteenth century. The two principal innovations that took place were securitization and stock substitution. Securitization uses the cash flows of illiquid claims as collateral for securities that can be traded in financial markets. In a stock substitution, existing securities are repackaged individually or as part of a portfolio to make them easier to trade, either in smaller denominations or at a lower cost than the underlying claims. Often these innovations were designed to overcome barriers associated with investing abroad, such as foreign registration requirements and the costs of collecting interest or dividends, which prevented smaller investors from participating in securities markets. This broadening of the Dutch capital market eventually led to the introduction of the forerunners of today's closed-end mutual funds and depository receipts.

Predecessors of Mutual Funds

Prior to the eighteenth century a number of investment vehicles emerged that created a joint interest in a pool of financial and nonfinancial assets. While these securities were not identical to modern mutual funds, they manifested many of its same characteristics. Their evolution sheds light on the first investment trusts to create tradable ownership of a financial securities portfolio. The first major type is a contract of survival. This type includes life annuities and, in particular, tontines. The second type includes plantation loans.

Life annuities are financial contracts whereby borrowers pay interest to the lender for the remainder of the lender's life, or that of a third person named in the contract. They differ from term loans, wherein the principal of the loan is repaid at the end of a prespecified term in the contract. Life annuities probably date back as early as 205 B.C.,[4] and they were quite common in the Middle Ages in France and Northern Europe before becoming an important vehicle for public finance in the seventeenth and eighteenth centuries. Chapter 12 provides an overview of the history of life annuities. One particularly interesting variation on life annuities known as the tontine bears some resemblance to mutual funds.

In a tontine, a borrower promises to pay to a group of individuals an annuity which will be divided among the surviving members. As members die, the payout to the survivors increases. Many early tontines were organized by governments, but examples of private tontines are known to date back to the seventeenth century. Unlike public tontines, in which

8

COPIA.

N°. EEN EN TWINTIG.

Conditien en Voorwaarden, daar op de ondergetekende Persoonen met den anderen geaccordeert, en over-een gekomen zyn, nopende het fourniſſement van een ſomme van tien duyſent guldens Capitaal, te conſtituëren op de reſpective Lyven van twintig Perſoonen, boven de dertig Jaaren oudt.

I.

DAt elk der Contractanten, tot de geſeyde Somme ſal moeten fourneren en opbrengen, voor yders portie, een Somma van vyf hondert Caroli guldens, binnen den tydt van acht dagen, naar 't paſſeren deſes, op Aſſignatie van de Gecommitteerdens, in handen van *Pieter de Lange*, als ſpecialyck by de Geintereſſeerdens daar toe geauthoriſeert mits deſen, verklarende yeder zyn beloofde Somma te conſtituëren ten lyve van ſoodanige Perſoonen, als yder by ſyne ondertekeninge ſal nomineren, ſynde alle geboren voor den eerſten July des jaars ſeſtienhondert ſeven en vyftig.

II.

Dat het voorſz. Capitaal van tien duyſent guldens alſoo gefourneert zynde, de naar te noemen Gecommitteerdens 't ſelve met den aldereerſten doenlyck, ſullen aenleggen en beſteden in Obligatien ten laſten van 't gemeene Landt, of oock wel op deſe Stadt, en andere publycque Comptoiren binnen de ſelve, naar ſy Gecommitteerdens raadtſaam en beſt oordeelen ſullen.

III.

Dat de voorſz. Obligatien, voor de voornoemde Capitale Somma als boven komende te proveniëren, op Intereſſen ſullen moeten loopen, ſoo lange dit Collegie of Contract ſal komen te duuren; en by aldien de ſelve Obligatien eerder mochten werden afgeloſt, ſullen de Gecommitteerdens als dan gehouden weſen, met den aldereerſten of wel binnen den tydt van vier weken, de penningen daar van procederende, wederom aan te leggen, als vooren Articul 2 geſeit is, oock mede bevorens de afloſſinge, alle mogelycke devoiren moeten aan wenden, omme de ſelve Obligatien, was 't doenlyck, noch loopende te houden.

IV.

Dat de Gecommitteerdens de Intereſſen der vooren geroerde Obligatien, t'elkens ten vervaldage; of binnen korten tydt daar na ſullen laten ontfangen, en alle Jaren laten maken een pertinente repartitie, gerekent naar 't getal der Perſoonen, die op de vervaldag van ~~het voorgaande Jaar in het leven geweeſt~~ zyn, en ingevolge van dien aan de Participanten, wegens de ſelve Perſoonen, de voorſz. ontfangen Intere ſyn ingeleyt Capitaal uytreycken en laten genieten, tot welcke uytreyckinge de voornoemde en *Sara de la Forterie* ſyn Huysvrouwe, of de langſt levende van hen beyde gecommitteert w en werden de Gecommitteerdens geauthoriſeert om naar 't overlyden van de langſtlevende, plaatſe te eligeren en aan te ſtellen, mits dat de ſelve woonachtig zy binnen deze Stadt.

V.

Dat de vervaltydt van deſe Lyfrenten Jaarlycks ſal zyn den eerſten Auguſti, aanvang ne klocke des nachts naar den laatſte July, 12 uuren zal hebben geſlagen, en zulcks het eerſte Auguſti 1688.

VI.

Dat alle de Intereſſen of Renten, die jaarlycks door 't overlyden van eenige der gemelte Lyv waar op yemandt van de Contractanten ſyne Actie ſal hebben geconſtituëert ſullen komen te ve om ſullen komen te accreſſeeren by egale repartitie, naar het getal van de noch vordere in ' Perſoonen, en ten profyte van de ſelve, of der ſelver recht hebbende, en alſoo te continuëren ſte toe, als in 't volgende Articul nader wordt uytgedruckt; des nochtans dat de Erfgenan hebbende van de geſtorvene, ſullen genieten de repartitie van het Sterf-jaar, daar inne de ſ zyn, ſoodanig als of hy het geheele Sterf-jaar hadt uytgeleeſt, mits het contract overleverend de de Contractanten in cas van overlyden van nu af aan, voor haar en hare Erfgenamen, v recht en actie, als ſy reſpectivelyck door haar furniſſement, tot het gemelte Capitaal en R hadt, ten behoeve van alle vordere Intereſſanten, aan welcke het voorſz. Capitaal, en de vo ſucceſſivelyck invoegen als vooren, ſullen komen te accreſſeren.

VII.

Dat alle de gemelte Lyven of Perſoonen, tot op twee na overleden zynde, alle de voorſz. C volkomen eygen ſullen zyn, aan de genen de welcke op de voorſz. twee laatſte Perſoonen heb hun recht hebbende, en onder de ſelve in gelycke Portien verdeelt moeten werden, niet eenen van beter of ſlechter Conſtitutie als d'andere ſoude mogen weſen; ſoo dat als dan yder als ſyn eygen goedt, naar ſich ſal vermogen te nemen, en daar mede doen en handelen naar ſ met ſyn ander vry eygen goedt kan en vermach te doen, en dat daar toe mede gerechtigt ſulle men of het recht hebbende van die gene, die uyt de gemelte twee laatſte Perſoonen voor de uy den ſoude mogen weſen; werdende mits deſen de Geintereſſeerdens ten lyve van de ſelve twee van het geſeyde Collegie, oock ſoo veel noodt zy, door hun overige Contractanten, nu

Was met verſcheyde handen ondertekent:

Iſaac de Leſpaul, ten ſynen lyve, oudt 34 jaren, gebooren van *Maria le Gay*.
Willem vander Burg, oudt omtrent 38 jaren, gebooren van *Reinburchie vanden Heuvel*, ten lyve van hem ſelven.
Sophia Grill, ten lyve van haar ſelven, oudt 33 jaren, daar moeder van is *Sophia Kraaſen*.
Everard van Ruytenbeecq, voor Reeckening, en ten lyve van *Heſter van Bronckhorſt*, oudt over de dertig jaren, daar moeder van is *Iſabella van Ruytenbeecq*.
Marco Anrelio del Borgo, ten lyve van de H^r. *Joſeph Coymans*, oudt 30 jaren, gebooren van *Sophia Trip*.
Hendrick Campen, voor Reeckening van *Jan vander Lught*, ten lyve van ſyn ſelven, oudt 37 jaren, gebooren van *Annetie Andrieſſe*.
Adriaen Temminck Jacobs, ten lyve van *Barandina Temminck*, oudt 33 jaren, gebooren van *Cornelia de Gyſelaers*.
Iſaacq Coymans, ten lyve van ſyn ſelfs, oudt 34. jaren, moeder *Helena Schuyt*.
Ferdinandi van Collen, ten lyve van myn ſelven, oudt 35 jaren, gebooren van *Suſanna van Uffelen*.
Pieter van Helsdingen, ten lyve van myn Huysvrouw, oudt 37 jaren, *Geertruyt Chaſtelyn* genaemt, gebooren van *Maria Nicolay*.
Pieter van Helsdingen, ten lyve van myn Nichte *Machtelt Motte*, oudt 37 jaren, woonende tot *Rotterdam*, gebooren van *Suſanna Chaſtelyn*.
Pieter Cleymies, voor en ten lyve van de H^r. *Matthens Pompe*, oudt 35 jaren, gebooren van *Mondina de Bevere*.
Otto Broocks, voor en ten lyve *Daniel Havard*, oudt omtrent 30 jaren, gebooren van *Elizabeth Vermeer*.
Jan Hinlopen, op het leven van de H^r. Secretaris *Jan van Maarſeveen*, oudt 30 jaren, gebooren van de Vrouw *Sophia Coymans*.
Johannes Romswinckel, ten ſynen lyve, oudt 33 jaren, gebooren van *Catharina Beddens*.
Jacob ten Grootenhuys, ten lyve van *Elizabeth de Dieu*, oudt 30 jaren, gebooren van *Petronella Haan*.
François le Gillon, ten lyve van de Heeren en M^r. *Willem* en *Gerard Backer*, beyde gebooren van Vrouwe *Chriſtina le Gillon*, op yeder een portie, *Willems Backer*, is den 21 Martius 1687. oudt geweeſt 31 jaren, ende *Gerard Backer*, den 15 May 1687. 30 jaren.
Direk Pater, voor twee portien, d'eene ten lyve van *Albert*, en d'andere ten lyve van *Pieter Reynſt*, d'eerſte oudt omtrent 33, en d'ander oudt omtrent 32 jaren, beyde gebooren van *Maria Pater*.

M. v. Heemſtee. *Cornelis Coſterus.* *Abraham de Wit.* *P: Keyſer.* *J. Martenſz.*

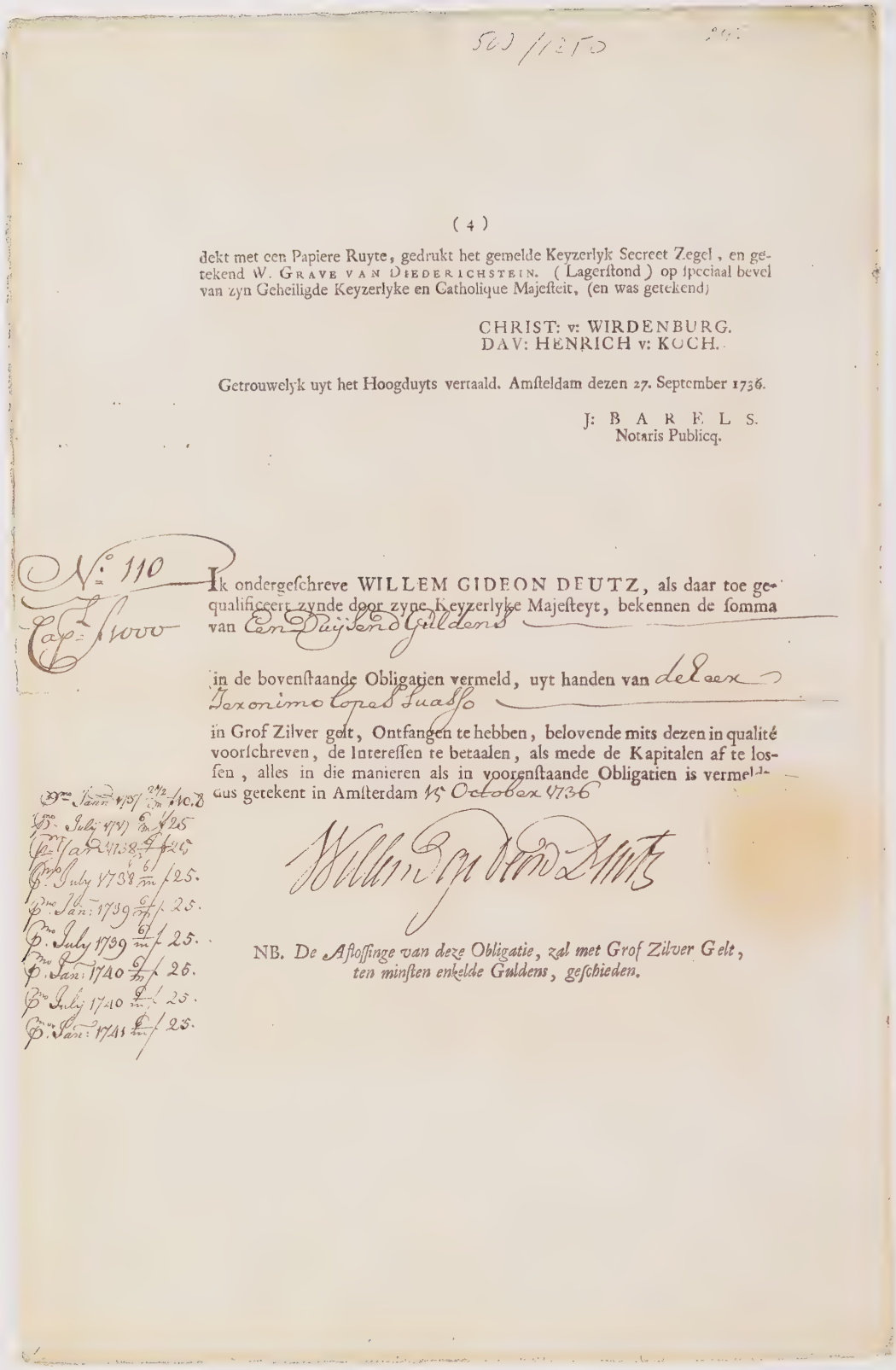
STEPH. PELGROM,
Notaris publicq.

WY ondergeſchreven Gecommitteerdens verklaren, dat door ofte van wegen d'E^d. *Heer* H^r *Dirck Pater* Schepen en Raadt deser Stadt

ten lyve van *de Heer Albert Reynst*

gefourneert is een ſomma van vyf hondert guldens, ende noch veertig guldens tot betalinge van 't Opgeldt der Obligatien, van de Intereſſen daar op te goedt, en van de onkoſten om dit Collegie op te rechten, en ſulcks dat de ſelve uyt dien hoofde, en ter dier ſomma geintereſſeert is in 't vooren-ſtaande Contract, 't welck na Collatie is bevonden te accorderen, met het Origineel onder N°. XXI. gepaſſeert op den xx. dach der Maand February 1687. en volgende dagen, voor den Notaris *Stephanus Pelgrom*, waar van de principale in de gemeene Yſere Kiſt is beruſtende.

Private capital tontine of 10,000 guilders on 20 lives. Amsterdam. February 20, 1687. A contract of survival, divided into twenty portions, on the lives of people born on or before July 1, 1657. The initial participant contributions would be invested in bonds of the city of Amsterdam or the State of Holland and kept in a safe at the office of a notary public. The annual interest would be divided among the holders of contracts on the surviving nominees—often family members—until all but two nominees had died. At that time the underlying bond portfolio would be split between the two remaining beneficiaries. The names of the subscribers and names and age of the nominees are printed on the back of the contract.



(4)

dekt met een Papiere Ruyte, gedrukt het gemelde Keyzerlyk Secreet Zegel, en getekend W. GRAVE VAN DIEDERICHSTEIN. (Lagerstond) op speciaal bevel van zyn Geheiligde Keyzerlyke en Catholique Majesteit, (en was getekend)

CHRIST: v: WIRDENBURG.
DAV: HENRICH v: KOCH.

Getrouwelyk uyt het Hoogduyts vertaald. Amsteldam dezen 27. September 1736.

J: BARELS.
Notaris Publicq.

N.° 110
Cap.l 1000

Ik ondergeschreve WILLEM GIDEON DEUTZ, als daar toe gequalificeert zynde door zyne Keyzerlyke Majesteyt, bekennen de somma van Een Duysend Guldens

in de bovenstaande Obligatien vermeld, uyt handen van de Heer Jeronimo Lopes Suasso

in Grof Zilver gelt, Ontfangen te hebben, belovende mits dezen in qualité voorschreven, de Interessen te betaalen, als mede de Kapitalen af te lossen, alles in die manieren als in voorenstaande Obligatien is vermeld, dus getekent in Amsterdam 15 October 1736

Willem Gideon Deutz

NB. *De Aflossinge van deze Obligatie, zal met Grof Zilver Gelt, ten minsten enkelde Guldens, geschieden.*

Five percent bond of 1,000 guilders issued by Gideon Deutz on behalf of Charles VI, back page. October 15, 1736.
William Gideon Deutz, Mayor of Amsterdam, modeled the first plantation loan after secured loans that his family firm made to the Austrian Empire. This is the back page of a 1736 loan the firm of Deutz issued in Amsterdam on behalf of Charles VI. The loan was secured by the royal possessions in Silesia.

the payment promise was backed by the power of taxation, private tontines required some form of collateral to guarantee the periodic payments to participants. This was often accomplished by using the participants' initial contributions to purchase financial securities. If the underlying portfolio paid interest at a fixed rate, then—barring default of the securities—the annual payments could be guaranteed. For example,[5] a 1746 private tontine with ten participants issued in the Town of Broek op Waterland in the Netherlands invested in bonds of Emperor Charles VI, which were collateralized by the proceeds of his possessions. If the investment portfolio of a private tontine consisted of company shares, no fixed payments could be guaranteed, and the participants could only hope that the company would continue its dividend policy. This was the case with a 1670 private tontine organized in Amsterdam among thirty participants who jointly invested in a share of the Middelburg chamber of the Dutch East India Company.[6] This private tontine is an example of a "capital tontine," in which the participants jointly owned the collateral. Unlike most government tontines, which promised an annuity but no repayment of principal, the collateral of a capital tontine would be divided among the remaining participants when a prespecified number of members of the group had died.

Private tontines resemble investment trusts in the joint ownership of financial securities. The difference from mutual funds becomes increasingly fine over time, as private tontine societies invested in diversified portfolios. For example, a private tontine organized in The Hague in 1770 under the name *Uit Voorzorg* invested its initial contributions in a portfolio of securities that closely resembled the investments of *Eendragt Maakt Magt* and other early mutual funds. However, shares in a tontine were difficult to transfer because they were tied to the lives of its nominees, and the objective of tontines was income smoothing rather than providing diversification or portfolio management to its participants. According to the directors of *Uit Voorzorg*, the society intended to use its revenues "to pay its members an annual sum of money in the form of a pension."

The second type of security that shares characteristics with mutual funds is the eighteenth century plantation loan, which securitized mortgages to planters in the West Indies. The practice of transforming private loans into publicly traded securities was pioneered by the firm of Deutz & Co. Johan Deutz was the factor of the Austrian emperor, and as early as 1695 Deutz advanced him loans requiring the revenues from his mercury mines as security. Subsequent loans to the emperor were financed by organizing a negotiatie under the direction of his heirs, who issued bonds in the Dutch capital market using these revenues as security.

In 1753 the firm of Deutz—then led by Gideon Deutz, also mayor of Amsterdam—applied the same technique to mortgage loans to West Indies plantation owners. The firm played a dual role of financier and commission agent. Deutz arranged to issue bonds in the Dutch capital market and used the proceeds to provide mortgages to the plantation owners in Suriname. In return, the owners were obliged to ship their crops back to Deutz, who acted as their commission agent in the Netherlands. The proceeds from these sales—as well as the real property of the plantations, including the equipment and the slaves—served as security for the interest and principal payments to the bondholders.

Similar loans soon followed from other firms to plantations in the Dutch colonies of Essequebo, Demerary, and Berbice, as well as to British plantations in the West Indies. Between 1753 and 1776 nearly two hundred plantation loans were brought to market in Amsterdam and accounted for the majority of new security introductions during this period. The plantation loans took many forms. Some were made to specifically named individual plantations or groups of plantations. Others indicated only the region where the

capital would be employed and left the merchant-financiers considerable freedom in allocating the bond proceeds. This left investors holding a security that promised fixed payments from an unspecified portfolio of mortgages, apparently without any recourse to the merchant-financiers. When many of the plantation loans defaulted at the end of the eighteenth century, investors were forced to convert their bonds into equity stakes in the plantations.

The plantation loans contain some elements of an investment trust, but their investments—mortgages to planters—were not securities in themselves, which disqualifies these negotiaties as mutual funds. Furthermore, their primary purpose was not to provide diversification or portfolio services to the general public. Merchants used their reputation to mobilize capital on behalf of planters in return for the right to factor shipments of tobacco, cocoa, and coffee. By issuing the bonds, they could expand their business without tying up the firm's capital. Nevertheless, the plantation loans were an important innovation in their own right because they securitized the debt service of loans to planters. As such, they can be viewed as the forerunners of modern mortgage-backed securities. Many of the early mutual funds allocated a significant portion of their portfolios to plantation loans, closely linking their fortunes when continental European conflicts led to a reshuffling of colonial possessions near the end of the eighteenth century.

Eendragt Maakt Magt

In July of 1774, an Amsterdam broker by the name of Abraham van Ketwich invited subscriptions to a negotiatie named *Eendragt Maakt Magt*. The negotiatie would invest in bonds issued by foreign governments and banks and in plantation loans in the West Indies. Investors were promised a dividend of 4 percent, with adjustments depending on the annual investment income of the portfolio. The initial plan was to dissolve the negotiatie after twenty-five years, at which time the liquidation proceeds would be distributed among the then remaining investors. Subscription was open to the public until all 2,000 shares were placed; thereafter participation in the fund would only be possible by purchasing shares from existing shareholders in the open market. Investors had a choice to either receive shares registered in their name, or purchase shares in bearer form (in blanco). The transfer of bearer shares was easier because it did not require registration with the issuer, but both types were freely tradable. Based on these characteristics, *Eendragt Maakt Magt* would most likely be classified today as a closed-end investment trust, which issues a fixed number of shares representing ownership of a portfolio of tradable securities. According to W.H. Berghuis, it is considered the first "mutual fund."

Much of what is known about *Eendragt Maakt Magt* is based on a manuscript copy of its "prospectus," drawn up by the notary public Paulus van Huntum, and an unissued copy of a share certificate, both of which have survived in the municipal archives of the City of Amsterdam. The share certificate is essentially a printed version of the prospectus and contains seventeen articles describing the details of portfolio formation, management fees, and payout policies.

Article I of the prospectus names Dirk Bas Backer and Frans Jacob Heshuysen as commissioners of the negotiatie who were entrusted with the oversight of the investment policies of the fund. The daily administration of the trust was assigned to the broker Abraham van Ketwich. In practice, the role of the commissioners was intended to be limited, because the prospectus allowed little discretion regarding the investment policies. Article II specifically detailed ten categories of potential investments:

NEGOTIATIE

onder de Zinſpreuk

EENDRAGT MAAKT MAGT.

Opgericht te AMSTERDAM.

CONDITIEN.

Articul I.

Deeze Negotiatie is onder 't opzigt van DE WEL EDELE HEEREN

DIRK BAS BACKER.

EN

FRANS JACOB HESHUYSEN.

Als COMMISSARISSEN hier toe verzogt en gecommitteerd.

En van den Makelaar ABRAHAM VAN KETWICH, als ADMINISTRATEUR.

En is beſtaande in diverſe Claſſen, alle onderling met elkanderen Gecombineerd en Verbonden; ieder Claſſe in Honderd Aandeelen; ieder Aandeel groot in Capitaal *f* 500 : :

Art. II.

Het Capitaal van ieder Claſſe dezer Negotiatie, beſtaat in de navolgende Effecten, als:

5 Obligatien op de DEENSCHE- en WEENER-BANKEN.
5 dito op de DEENSCHE TOLLEN, en HOLSTEYN.
5 dito op RUSLAND, en ZWEEDEN.
5 dito op BRUNSWYK, en MEKLENBURG.
5 dito op de SAXISCHE POSTERYEN, en BRABANDSCHE MOERLANDEN.
5 dito op de SPAANSCHE CANAALEN IMPERIAAL en TAOUSTE.
5 dito op de ENGELSCHE COLONIEN, onder Borgtogt en Guarantie van de Heeren *Hope* en *Comp.*, *Vernede* en *Comp.*, *J. Hodshon*, *Dedel* en *Roquette*, en *B. van Homrigh*.
5 dito op ESSEQUEBO, ten Comptoiren van de Heeren *J. van Rynevelt* en *Zoon*, *D. Changuion*, *K. van den Helm Boddart*, *A. J. Heshuyſen* en *Comp.* en *D. W. van Vlooten*.
5 dito op de BERBICE, ten Comptoiren van de Heeren *J. A. Charbon*, en *L. Schumacher*.
5 dito op de DEENSCHE AMERICAANSCHE EILANDEN, ten Comptoiren van de Heeren *Bouwen* en *van der Hoop*, *J. Hodshon*, *H. Hofham* en *Zoon*, *Lever* en *de Bruine*, en *Nauta Beukens* & *Volkmar*.

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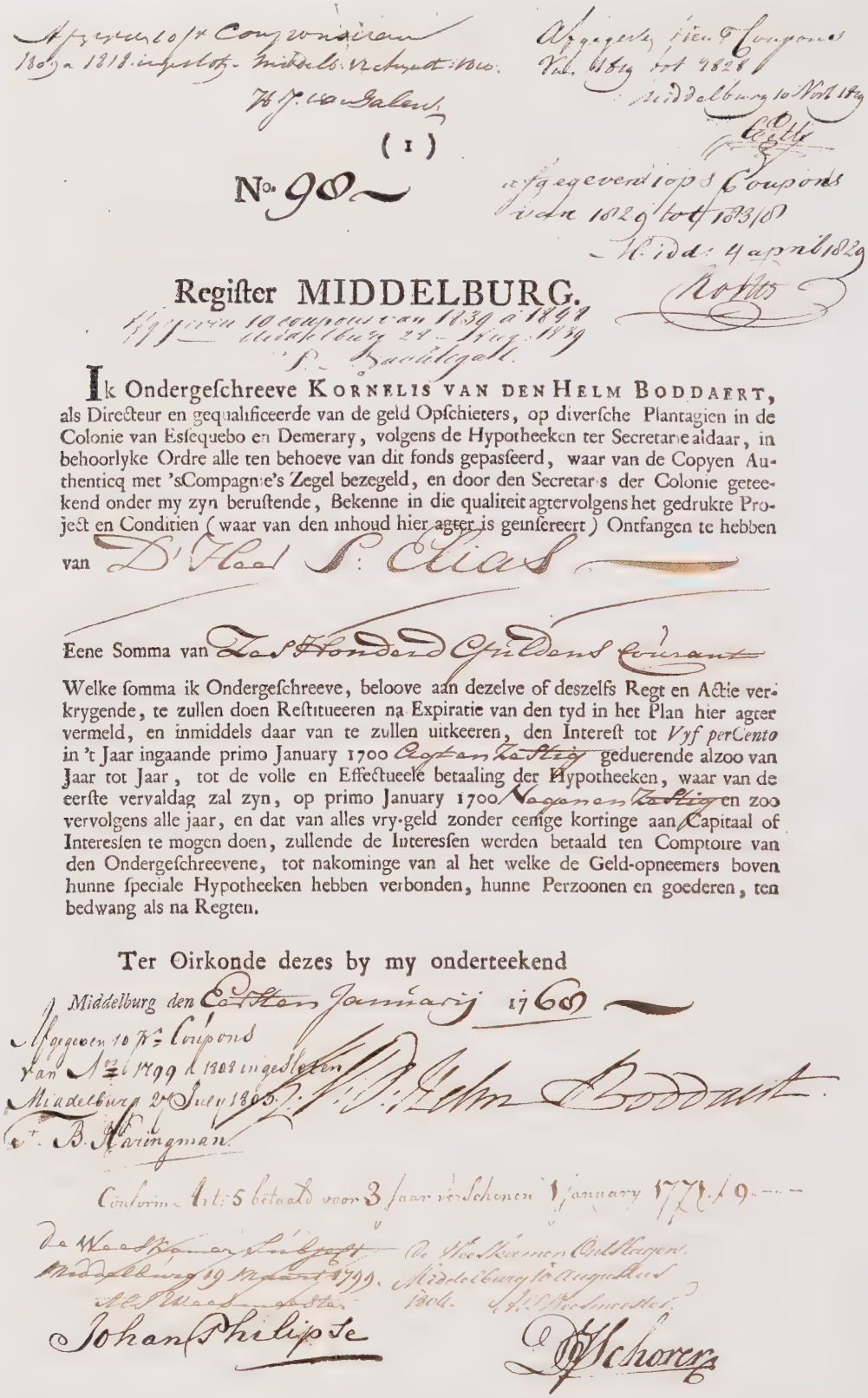
50 Obligatien, ieder groot Een duizend Guldens, is te zamen in Capitaal *f* 50,000 —

En ieder Claſſe ten minſte in 20 a 25 differente zoorten van bovenſtaande Effecten; dog niet meer als 2 of 3 Obligatien van een en dezelve Negotiatie, zynde verder in alles, zo veel mogelyk was, eene gelyke eevenreedigheid in acht genoomen.

Art. III.

Title page of a share in Eendragt Maakt Magt. The first page of a share in *Eendragt Maakt Magt* contains a list outlining the composition of the investment portfolio.



(1)

No. 90

Regiſter MIDDELBURG.

Ik Ondergeſchreeve KORNELIS VAN DEN HELM BODDAERT, als Directeur en gequalificeerde van de geld Opſchieters, op diverſche Plantagien in de Colonie van Eſſequebo en Demerary, volgens de Hypotheeken ter Secretarie aldaar, in behoorlyke Ordre alle ten behoeve van dit fonds gepaſſeerd, waar van de Copyen Authenticq met 'sCompagnie's Zegel bezegeld, en door den Secretaris der Colonie geteekend onder my zyn beruſtende, Bekenne in die qualiteit agtervolgens het gedrukte Project en Conditien (waar van den inhoud hier agter is geinſereert) Ontfangen te hebben van D'Heer S. Elias

Eene Somma van Een Honderd Guldens Courant

Welke ſomma ik Ondergeſchreeve, beloove aan dezelve of deszelfs Regt en Actie verkrygende, te zullen doen Reſtitueeren na Expiratie van den tyd in het Plan hier agter vermeld, en inmiddels daar van te zullen uitkeeren, den Intereſt tot *Vyf per Cento* in 't Jaar ingaande primo January 1700 Agtien Honderd gedurende alzoo van Jaar tot Jaar, tot de volle en Effectueele betaaling der Hypotheeken, waar van de eerſte vervaldag zal zyn, op primo January 1700 Negenen Tachtig en zoo vervolgens alle jaar, en dat van alles vry-geld zonder eenige kortinge aan Capitaal of Intereſſen te mogen doen, zullende de Intereſſen werden betaald ten Comptoire van den Ondergeſchreevene, tot nakominge van al het welke de Geld-opneemers boven hunne ſpeciale Hypotheeken hebben verbonden, hunne Perzoonen en goederen, ten bedwang als na Regten.

Ter Oirkonde dezes by my onderteekend

Middelburg den Een en Een January 1769

J. P. D. Van Boddaert

P. B. Maringman

Conform Art: 5 betaald voor 3 jaar verſchenen 1 January 1771. 19

De Weesheeren Beſlagen. Middelburg 19 Augustus 1799. Johan Philip Se

De Weesheeren Beſlagen. Middelburg 30 Augustus 1806. P. Schorers

Plantation bond issued by Kornelis Van Den Helm Boddaert. January 1, 1768. This bond was one of the securities *Eendragt Maakt Magt* invested in. The twenty-year, 5 percent bond was secured by mortgages on plantations in the Colonies of Essequebo and Demerary. To secure the payments to the bondholders, up to five-eighths of the appraised value of the plantations could be mortgaged. Plantations needed to be periodically reappraised. The mortgage arrangement with the plantation owners includes a variety of clauses to ensure repayment. The plantation would be collateral to the loan. And when a plantation owner shipped his goods to Europe to be sold, he was obliged to insure the shipments for prespecified amounts.

Danish and Viennese banks
Danish Tolls and Holsteyn
Russia and Sweden
Brunswick and Mecklenburg
Postal services of Saxony and Peatlands of Brabant
Spanish Canals Imperial and Taouste
British Colonies, under guarantee of Messrs. Hope and Comp., Vernede and Comp., J. Hodshon, Dedel and Roquette, and B. van Homrigh
Essequebo, at the offices of Messrs. J. van Reynevelt and Son, D. Changuion, K. van den Helm Boddart, A. J. Heshuysen and Comp., and D. W. van Vlooten
Berbice, at the offices of Messrs. J. A. Charbon and L. Schumacher
Danish American Islands, at the offices of Messrs. Bouwen and van der Hoop, J. Hodshon, H. Hofham, and Son, Lever and de Bruine, and Nauta Beukens & Volkmar

The securities were either international bonds or negotiaties to planters (plantation loans) geographically grouped and further identified by their respective organizers.

The organizers were apparently quite sensitive to their fiduciary responsibilities to investors. The prospectus required Van Ketwich to provide an annual accounting to the commissioners and produce, upon request, full disclosure to all those interested parties, as to ensure "good and proper management at all times." For his services, the administrator would receive a commission of 0.5 percent at the founding of the trust, plus an annual compensation of 100 guilders per class.[8] The physical securities that the trust invested in were stored at the office of Van Ketwich in an "iron chest with three differently working locks" to which the commissioners and the notary public kept the keys.

In addition to specifying its investments, the prospectus required that the portfolio would be diversified at all times. The 2,000 shares of *Eendragt Maak Magt* were subdivided into twenty "classes," and the capital of each class was to be invested in a portfolio of fifty bonds. Each class was to consist of at least twenty to twenty-five different securities, to contain no more than two or three of a particular security, and to "observe as much as possible an equal proportionality."

Despite this explicit diversification requirement, *Eendragt Maakt Magt* contained a curious and complicated lottery, which, from a diversification perspective, imposed unnecessary risks on its investors. The lottery worked as follows: not all investment income from the portfolio would be passed on to the fund investors, but a portion was to be used to retire shares by lot at a premium and also increase dividends to some of the outstanding shares. Specifically, the promised dividend payout of the fund was 4 percent per annum, which was below the nominal interest rate on the bonds it invested in.[9] As long as the bonds in the portfolio did not default, the excess of income over payout would accrue in a cash reserve account, which was used annually to repurchase one share determined by lot from each class at a premium of 20 percent over par. At the same time future dividends on the neighboring shares would be increased. Article IV in the prospectus gives the following example:

> The interest on redeemed shares will accrue to the holders of the preceding and succeeding shares: for example if share number 50 is redeemed, the annual interest of No. 49 and 51 will increase by 2 percent to 6 percent. If No. 49 is redeemed next, the interest of No. 48 and 51 will be augmented by 3 percent, hence 7 percent for No. 48 and 9 percent of No. 51.

Conditien van Negotiatie, tot

een Fonds waar uit, onder Directie van DANIEL CHANGUION, aan eenige Planters in *Rio Eſſequebo* en *Rio Demmerary*, tot voortzetting en verbeetering hunner Plantagien een Somma van *f* 400000:- voor 10 Jaaren zal werden gefourneert, teegens den Intreſt van 6 pC^to^. 's Jaars.

1816.
Bet 10 Gl
en uitgegeven
10 Coupons.

Art. 1.

De Planters in opgemelde Colonien, welke geneegen zyn eenige Gelden ter verbeeteringe en voortzettinge hunner Plantagien op te neemen, en daar toe door den Directeur zyn geaccepteert, zullen gehouden zyn ten hunnen kosten, gemelde Plantagien door be-ëedigde Priſeurs behoorlyk te laten Inventariſeeren, zoo de Gronden, Gebouwen, Werken, Slaven en Slavinnen, en generaallyk wat verder daar toe behoord, met uitſluiting van Meubelen en andere Zaken, onnodig tot het bewerken van een Plantagie, en den vollen en onbelasten Eygendom van dien Inventaris door hun beëedigd, door gemelde Taxateurs doen in waarde brengen.

2.

Den Inventaris als hier voren bepaald, opgemaakt en gepriſeert weeſende, zal aan *Daniel Changuion*, moeten werden gezonden, beneevens de behoorlyke Hypotheecq of Verbandbrief, waar uyt zal moeten blyken dat deſelve Hypotheecq, ter Secretary van de Colonie behoorlyk geregistreert is, en dat geen andere Speciale of Generale verbanden op deſelve Effecten zyn leggende, als meede dat geen verbanden zullen worden goedmitteert of geregistreert, buyten conſent van de Geldſchieters in deeſen.

3.

Aan de Planters welke den Inventaris en Verbandbrief als boven zullen overmaken, zal worden geſchoten de helft of uyterlyk vyf agtſte der waarde waar op derzelver Plantagien, met hun toebehooren, zyn getaxeerd, teegens den Intreſt van Ses pCento in 't Jaar, die zy zig verbinden Jaarlyks boven alle andere Laſten te voldoen, op Pœne in de Verbandbrief vermeld.

4.

De Geld-opneemers, welke Jaarlyks met Valable bewyzen kunnen aantoonen, dat hunne bezittingen daar door zyn verbeetert, zullen vryheid hebben, op een nieuwe Priſatie als boven gemeld te doen, van het meerder bedragen der waarde, nog op te neemen de helft van de verbeetering, mits dezelve aan voorn: *Daniel Changuion* mede Verhypothequeerende.

5.

De Respective Planters Geld-opneemers, verbinden zig alle hunne te zendene Producten te addreſſeeren aan, nodige Proviſien te ontbieden van, en de Wiſſelbrieven te trekken op *Daniel Changuion*, als meede by afzending hunner Producten, aan hem in tyds behoorlyke opgaave ter bezorging der noodige aſſurantie te geeven, met overgifte dat in gevalle zy daar aan niet mogten voldoen of ook hunne Producten in de respective Colonien kwamen te Verkoopen, of op andere wyze te diverteeren, en in gebreeken bleeven Jaarlyks hunne Intreſt te voldoen, het by hun genotene Capitaal met de Intreſſen directelyk zal konnen worden opgeeyscht, en geheellyk ten koſten van zodanige Planters, by Executie verhaalt, aan hunne Perſoonen, Plantagien met al derzelver toebehooren, en verdere zoo roerende als onroerende Goederen, zig hier toe voor de Hove van Juſtitie in de Colonie, of waar het anders zoude mogen vereyscht werden, by vrywillige Condemnatie verbindende.

6.

De Geldgeevers behouden aan zig de vryheid, zodanige en zo veele Perſoonen in de Rivieren van *Eſſequebo* en *Demerary* aan te ſtellen en te qualificeeren, als zy

A zul-

Preamble of a 1769 plantation loan of Daniel Changuion, one of the investments of Eendragt Maakt Magt:

Conditions of a negotiatie, for a fund, under the direction of
Daniel Changuion, to furnish a sum of F. 400,000;- to planters
in *Rio Essequebo* and *Rio Demerary*, for continuation and improvement of their plantations at an annual interest rate of 6 percent.

Article 1. The Planters in aforementioned colonies, which are inclined to draw moneys for improvement and continuation of their plantations, and have been approved by the director, are obliged at their own cost to have their plantations appraised by sworn appraisers, including the grounds, buildings, works, male and female slaves, and other belongings, but excluding furnishings and things that are unnecessary for cultivation.

This curious augmentation of the cash flow rights created heterogeneity among the outstanding shares after the first redemption had taken place, introducing a complexity to the valuation of the shares that would challenge even many modern-day quantitative investors. Knowledge of the dividend on a particular share would not be sufficient to determine its value to a potential buyer. To accurately value each share, investors would have to know either the dividend on all the other shares or the numbers of the retired shares and the order of redemption.[10]

Although curious from a modern-day perspective, lotteries were a common element of eighteenth-century securities, and it is likely that Van Ketwich modeled his investment trusts after other existing negotiaties. For example, a negotiatie on loans to planters in Essequebo and Demerary introduced in 1772 by Karel van den Helm Boddaert and Adolf Jan van Heshuisen and Co. (family and business associate of the director of *Eendragt Maakt Magt*) contained a very similar lottery provision. The mortgages of this negotiatie were projected to earn 8 percent per annum, of which only 4 percent would initially be passed on to investors as dividends. The remainder of the investment income was used to retire shares at a premium over par and gradually increase the dividends on the remaining shares to 6 percent per annum. The prospectus of this plantation security contains a detailed schedule of gradual capital repayment over a twenty-five-year period.

The embedded lottery should not detract from the significance of *Eendragt Maakt Magt*: it offered investors an opportunity to participate in and trade a diversified portfolio of securities. Because the prospectus allowed little flexibility with respect to the fund's investment policies, it is unlikely that Van Ketwich aimed to attract investors by offering superior returns through professional portfolio management. *Eendragt Maakt Magt* simply repackaged existing securities that were already traded in the Amsterdam market. The negotiatie was likely aimed at smaller investors, who would be unable to achieve this level of diversification on their own account. The bonds in its portfolio had a face value of 1,000 guilders, and replication of the portfolio by purchasing these securities in the open market was only feasible for investors of considerable wealth. *Eendragt Maakt Magt* created an opportunity to obtain portfolio diversification in portions of 500 guilders.

Little direct evidence exists about what motivated Van Ketwich to organize the fund, but circumstantial evidence is consistent with the objective of diversification. Its inception follows the financial crisis of 1772–1773, which bankrupted British banks due to overextension of their position in the British East India Company. When the crisis spread to Amsterdam, several banking houses were pushed to the brink of default. Being a broker, Van Ketwich may have perceived a sentiment for diversified investments among his clientele. Subsequent negotiaties in which Van Ketwich was involved explicitly advertise the benefits of diversification to attract small investors. It is perhaps surprising that the portfolio did not include equity shares or domestic and British bonds, but share material was relatively scarce, and domestic interest-bearing securities were available in small denominations.

Subsequent Funds

The initial success of *Eendragt Maakt Magt* soon invited followers. In 1776 a consortium of Utrecht bankers founded the negotiatie *Voordeelig en Voorsigtig* (Profitable and Prudent). This time Abraham van Ketwich did not act as an administrator, but the prospectus lists his office as a collection agency for periodic dividend payments, which suggests

NEGOTIATIE

onder de Zinſpreuk

CONCORDIA RES PARVÆ CRESCUNT.

Opgericht te AMSTERDAM.

Deeze Negotiatie is onder 't opzigt van den Wel Edelen Geſtr: HEERE

SEBASTIAAN VAN NOOTEN JANSZ.,
Scheepen der Stad Amſterdam &c. &c.

En den Wel Edelen HEERE

DIRK BAS BACKER,
Directeur van den Levantſchen Handel en Navigatie op de Middelandſche Zee &c. &c.

Als COMMISSARISSEN hier toe verzogt en gecommitteerd.

En van den Makelaar ABRAHAM VAN KETWICH, als ADMINISTRATEUR.

Beſtaande in diverſe Clasſen, alle onderling met elkanderen gecombineerd, en verbonden, ieder Clasſe in Honderd Aandeelen, ieder Aandeel groot in Capitaal *f* 500:-

't Capitaal deezer Negotiatie zal geëmployeert worden, tot den aankoop van DIFFERENTE SOORTEN VAN SOLIDE EFFECTEN, ALS MEEDE VAN DE ZOODANIGE, WELKE *door derzelver zoo zeer verminderde Pryſen*, OP GOEDE GRONDEN SPECULATIE MERITEEREN, zullende 'er geene werden aangenoomen, als die, waar van men exacte berichten, omtrent derzelver Reëliteit heeft bekoomen; en, na den Inkoopprys gereekend, beneeden derzelver intrinſique waarde kunnen worden aangekocht; waarvan dus met alle reeden, een important voordeel te verwachten is.

De Intresſen der Effecten, aan deeze Negotiatie behoorende, zullen jaarlyks worden beſteed tot betaaling van 4 pCto. voor Intresſen, en voorts, tot aflosſing van zoo veele Aandeelen, als telkens mogelyk zal wezen; zullende deeze aflosſing by Looting ten overſtaan van Notaris en Getuigen geſchieden, en ieder uitgetrokken Aandeel groot in Capitaal *f* 500:- worden afgeloſt, en gerembourſeert met een Somma van *f* 600:-

De Intresſen der afgeloſte Aandeelen, zullen ſtrekken tot augmentatie, der even voorgaande en volgende Nommers; welke augmentatien, zoo dikwils zullen verdubbelen, als 'er een aflosſingen op eene voorgaande of volgende Nommer voorvald, (by voorbeeld) No. 50. afgeloſt zynde, zal No. 49 en 51. vervolgens yder 6 pCt. 's jaars genieten, en No. 51 naderhand afgeloſt worden-

Concordia Res Parvae Crescunt, *unissued share certificate, 1779. Concordia Res Parvae Crescunt* was possibly the first value fund.

that he was closely involved. The prospectus of *Voordeelig and Voorsigtig* is accompanied by an appendix, which explains the advantages of diversified investing using *Eendragt Maakt Magt* as an example. Its opening paragraph states that it is undisputable that prudent investing requires the manager

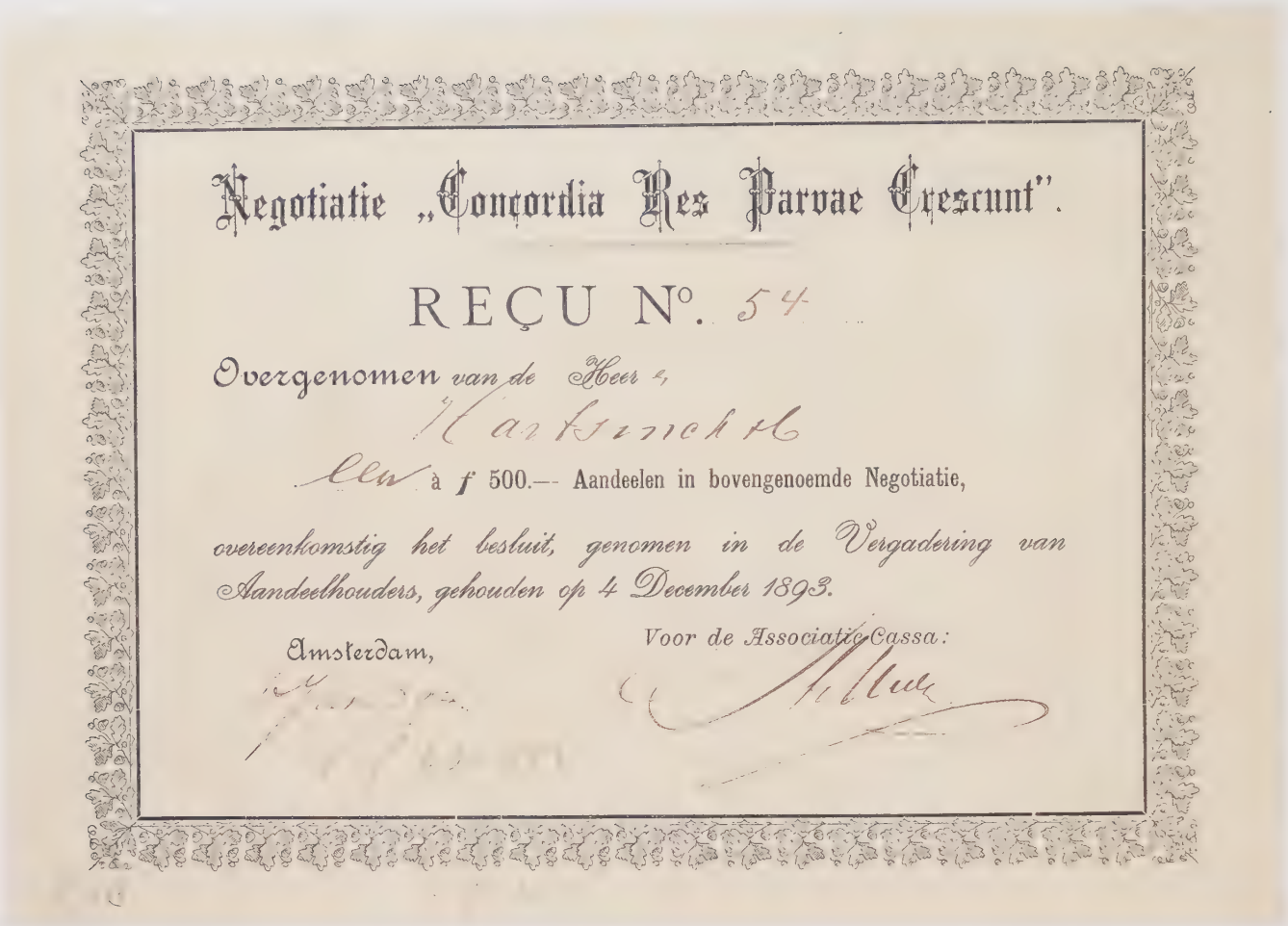
> to spread as much as possible monies over good and solid securities. Because nothing is completely certain but subject to fluctuations, it is dangerous for people to allocate their capital to a single or a small number of securities. Not everyone has the opportunity to invest his money in a variety of securities. . . . For the sum of 525 guilders one can participate in this negotiatie . . . , which will be profitable with sufficient certainty. No one has reason to expect that all securities in this negotiatie will cease to pay off at the same time, and the entire capital be lost. If one had reason to fear such general bankruptcy, one never ought to invest any money.[11]

The prospectus of *Voordeelig en Voorsigtig* closely followed the wording of *Eendragt Maakt Magt*, and its investment list mirrored its predecessor, including the diversification requirement. Forty percent of the portfolio was to be allocated to plantation loans, although these were not detailed by name. The most interesting difference is that shares of *Eendragt Maakt Magt* were listed among the potential investments of the fund. *Voordeelig and Voorsigtig* was a "fund of funds."

In 1779, Abraham van Ketwich introduced his second mutual fund under the name *Concordia Res Parvae Crescunt*, the Latin origin of *Eendragt Maakt Magt*.[12] While Van Ketwich's second fund resembled his first in both name and structure, an important difference was that he opted for more freedom in investment policy. The prospectus only states that the negotiatie would invest in "solid securities and those that based on decline in their price would merit speculation and could be purchased below their intrinsic values, . . . of which one has every reason to expect an important benefit," a phrasing which suggests that *Concordia Res Parvae Crescunt* may be the grandfather of modern value funds.

Fortunes of Early Mutual Funds

The fortunes of the early mutual funds are closely linked to the fortunes of their predominant investments—plantation loans in the West Indies. The outbreak of the Fourth English War in 1780 hampered colonial shipments to their Dutch commission agents, affecting the proceeds that were pledged as the security for holders of the plantation loans. For example, the price of Deutz's first plantation loan fell by 35–40 percent and bondholders were asked to accept interest rate reductions. In 1782, the decline in investment income forced Van Ketwich to suspend the redemption of shares in *Eendragt Maakt Magt* and lower dividend payments several years later.[13] By the end of the century all three funds had disappeared from the official published price record of the Amsterdam stock exchange, and transaction prices show up only at irregular private auctions by securities brokers. In 1799, at the end of the scheduled life of *Eendragt Maakt Magt*, participants agreed to extend the negotiatie until the shares could be redeemed at par. In 1803 the management of the affairs of *Eendragt Maakt Magt* and *Concordia Res Parvae Crescunt* were taken over by the firm of Van Ketwich and Voomberg. By 1811 the share price of *Eendragt Maakt Magt* reached a low of 25 percent of its nominal value of 500 guilders, but eventually recovered. This seems miraculous, but the fund actively repurchased shares in the open market when prices were


Negotiatie „Concordia Res Parvae Crescunt".

RECU N°. 54

Overgenomen van de Heer

Een à f 500.— Aandeelen in bovengenoemde Negotiatie,

overeenkomstig het besluit, genomen in de Vergadering van Aandeelhouders, gehouden op 4 December 1893.

Amsterdam,

Voor de Associatie-Cassa:

Liquidation receipt of Concordia Res Parvae Crescunt. *Concordia Res Parvae Crescunt*, formed in 1779, was scheduled to exist for twenty-five years. When it was liquidated in 1893, investors received a final payment of 430,55 for each share of 500 guilders.

depressed. In 1824, a liquidating dividend of 561 guilders was paid to the remaining participants. Final settlement of shares in *Concordia Res Parvae Crescunt* took substantially longer. It existed for 114 years, until 1893 when it was officially dissolved. In 1894, a final distribution of 430.55 guilders per share of 500 guilders was paid, or 87 percent of the original investment. Despite its misfortunes, or perhaps due to them, *Concordia Res Parvae Crescunt* is probably the longest mutual fund to have ever existed.

Speculation on the Financial Fortunes of the United States

Despite the poor performance of the first investment trusts, there are also many success stories. During the 1780s and 1790s more than thirty investment trusts emerged with a single objective: speculation on the future credit of the United States. Together with France and Spain, the Netherlands was one of the major financiers of the American Revolution. Between 1782 and 1791, an estimated 32 million guilders were raised in Amsterdam and Antwerp, much of which was spent to finance supplies. These advances occurred following a period of steady deterioration in the credit of the United States. The war

Treasury of the United States

(No. 4294) Register's Office 16 June 1792

BE IT KNOWN that there is due from the United States unto of America unto Daniel Crommelin & Sons of Amsterdam Merch^ts or their Assigns the Sum of Ten Thousand Dollars

bearing Interest at Six per Cent per Annum from the first Day of January A. D. One Thousand Eight Hundred and One, inclusively; payable quarter yearly, and subject to Redemption by Payments, not exceeding, in one Year, on Account both of Principal and Interest, the Proportion of Eight Dollars upon a Hundred of the Stock bearing Interest at Six per Cent; created by Virtue of an Act making Provision for the Debt of the United States, passed on the fourth Day of August, 1790, which Debt is recorded in this Office, and is transferable only by Appearance in Person, or by Attorney, at the proper Office, according to the Rules and Forms instituted for that Purpose.

$10.000 Dollars.

Joseph Nourse Reg^r

I CLEMENT BIDDLE, Notary Public for the Commonwealth of Pennsylvania, duly commissioned and qualified, dwelling in the City of Philadelphia, certify and make known unto all Persons to whom these Presents shall come or may concern, that upon the twenty Second Day of

Duplicate certificate of the registar's office of the Treasury of the United States. June 6, 1792. Between 1787 and 1804, twenty-nine trusts were introduced in Amsterdam speculating on the fortunes of the United States. Dutch financiers would take inscriptions in U.S. debt and sell these through an investment fund to the public. The top half of the certificate is signed by the registrar Joseph Nourse and declares that the United States owes Daniel Crommelin and Sons $10,000, in the form of funded deferred debt bearing interest at 6 percent per annum after January 1, 1801. The bottom half contains a statement by Clement Biddle—as notary public—declaring that he has verified that the copy is an exact duplicate of the original.

expenses, combined with a limited ability to raise revenues through taxation, had flooded the American market with paper currency, issued by both the states and the Continental Congress. The currency was expected to be self-liquidating as it was used to settle future taxes, but currency issues had far outgrown the anticipated tax liabilities. The consequence was a steady depreciation of the value of the continental currency. Currency, however, constituted only a fraction of the paper obligations in circulation. During the war, the quartermaster and commissary departments had issued certificates to private individuals in lieu of impressments of goods, and soldiers had been issued certificates for military pay. Combined with a myriad of interest-bearing debt instruments issued by the federal government and the states, the result was an economy flooded with financial paper claims. To make matters worse, nobody knew the exact magnitude of the outstanding obligations or who was responsible for repayment. Some states retired obligations from the Congress, while other states argued that Congress was responsible and should assume part of the states' debts that were incurred through the war. In 1782 Congress sent commissioners to the states to inventory all outstanding obligations. If claims were stated in depreciated currency they were to be translated into specie value, and for the balance "final settlement certificates" were issued. This process of "liquidation" established the outstanding balance of the government's obligations but did not solve the problem of how to pay for them. Investors were mixed about the prospects for full repayment as reflected in the market price of liquidated debt traded, which fluctuated between 15 and 40 cents on the dollar in 1788, depending on location and type of the original claim.

In this same year, the Amsterdam bankers Pieter Stadnitski and Hendrik van Vollenhoven organized a negotiatie holding liquidated debt of the United States. The prospectus states that the investment portfolio consisted of 6 percent liquidated debt with a face value of $840,000, which was acquired for 60 cents on the dollar. At the going exchange rate of 2.35 guilders to the dollar the portfolio was valued at about 1.2 million guilders. Stadnitski and Van Vollenhoven sold 1,200 shares of 1,000 guilders in this negotiatie in the Amsterdam market. The negotiatie was planned for twenty-five years, and the prospectus called for a gradual redemption of shares over the life of the fund. Like Van Ketwich's negotiaties, this was accomplished using a portion of the investment income to redeem shares at a premium while keeping the underlying collateral intact. But instead of increasing the dividends on unredeemed shares, the excess of investment income over promised dividends was used to accelerate the rate of share redemption over time at increasing premiums. For example, thirty-six shares would be redeemed by lot with a 3 percent premium after one year, thirty-eight with a premium of 6 percent the next year, increasing gradually to sixty-one shares with a premium of more than 70 percent at the end of year twenty-four. This planned redemption schedule was certainly aggressive, and it would be possible only as long as the United States did not default on its interest payments. Annual expected interest income would be 6 percent of $840,000, or 118,440 guilders. By contrast, promised interest in the first year was 6 percent of 1,200,00 guilders or 72,000 guilders, which would steadily decline after shares were redeemed over time. Investors whose shares were redeemed would receive a certificate entitling them to 1/1,200 share of the liquidation value of the investment portfolio at the end of the negotiatie.

These terms were certainly attractive relative to the promised returns on other forms of debt securities in the Amsterdam market and stalled subsequent efforts of the United States to place new loans in the Netherlands. Why would investors pay 100 percent on the dollar for a new loan at 6 percent when similar claims could be purchased at a 40 percent discount through investment trusts? If the United States were to ultimately honor its

obligations, new bonds would offer their promised 6 percent return, while an investment in the negotiatie would yield between 8 and 14 percent, depending on the exact moment of redemption. No matter the course of events, Stadnitski and Van Vollenhoven were to be the major beneficiaries in this negotiatie: although the prospectus called for a 1 percent annual management fee on the investment income of their portfolio, the bulk of their compensation was to be received up front. Shares in their investment trust were sold at a price that implicitly valued the liquidated debt of the United States at 60 percent of its face value, but it is estimated that the debt had been purchased at around 42 cents on the dollar, an immediate return of almost 50 percent.

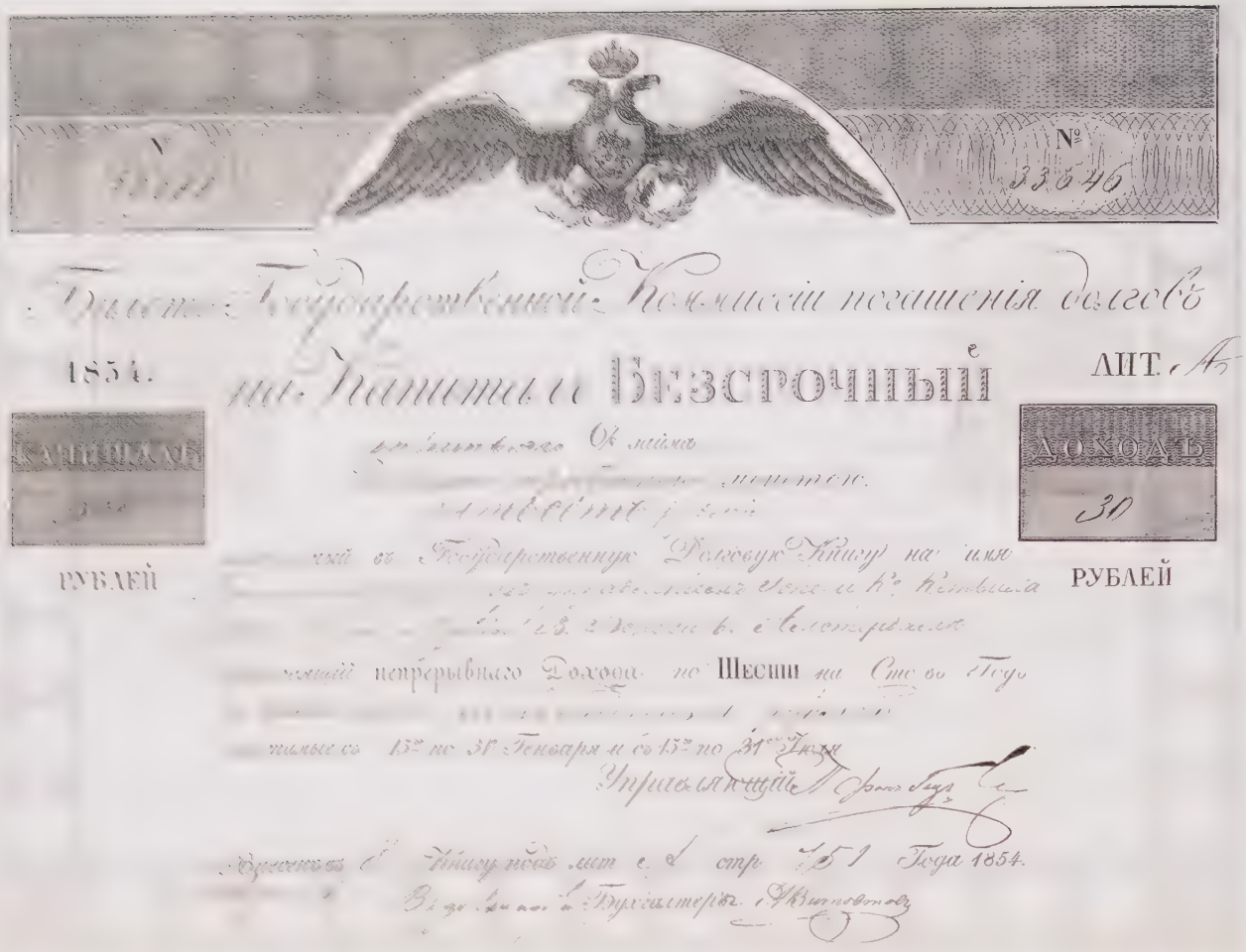
According to P. J. van Winter, the negotiatie of Stadnitski and Van Vollenhoven was the first of a series of twenty-nine trusts investing in United States debt that were successfully placed in the Amsterdam market between 1787 and 1804.[14] Similar negotiaties were organized by the firms of W&J Willink, N&J Van Staphorst & Hubbard, and Daniel Crommelin and Sons. Their success made them the dominant category of foreign investments listed in the Amsterdam Prijs-Courant during the early 1800s.

Depository Receipts

Closed-end mutual funds and plantation loans are examples of liquidity creation through asset substitution and securitization. The plantation loans created a tradable interest in portfolios of illiquid mortgages, and mutual funds made it possible for small investors to hold and trade diversified portfolios of securities. While diversification was not the primary motive behind the funds invested in the U.S. debt, the trusts provided domestic liquidity in foreign securities that were difficult to trade in Amsterdam due to the foreign registration requirements. It would take two more decades for the purest form of asset substitution to emerge, directly aimed at lowering the cost of foreign investing.

In the eighteenth and nineteenth centuries much of government borrowing took place through a "book of public debt," a large ledger containing the names of investors. Investors would receive a receipt that could be presented at the treasury to collect periodic interest payments. Although foreign participation was not precluded per se, in practice it was limited to large investors and financial institutions that could overcome the registration requirements and difficulties associated with the collection of interest abroad.

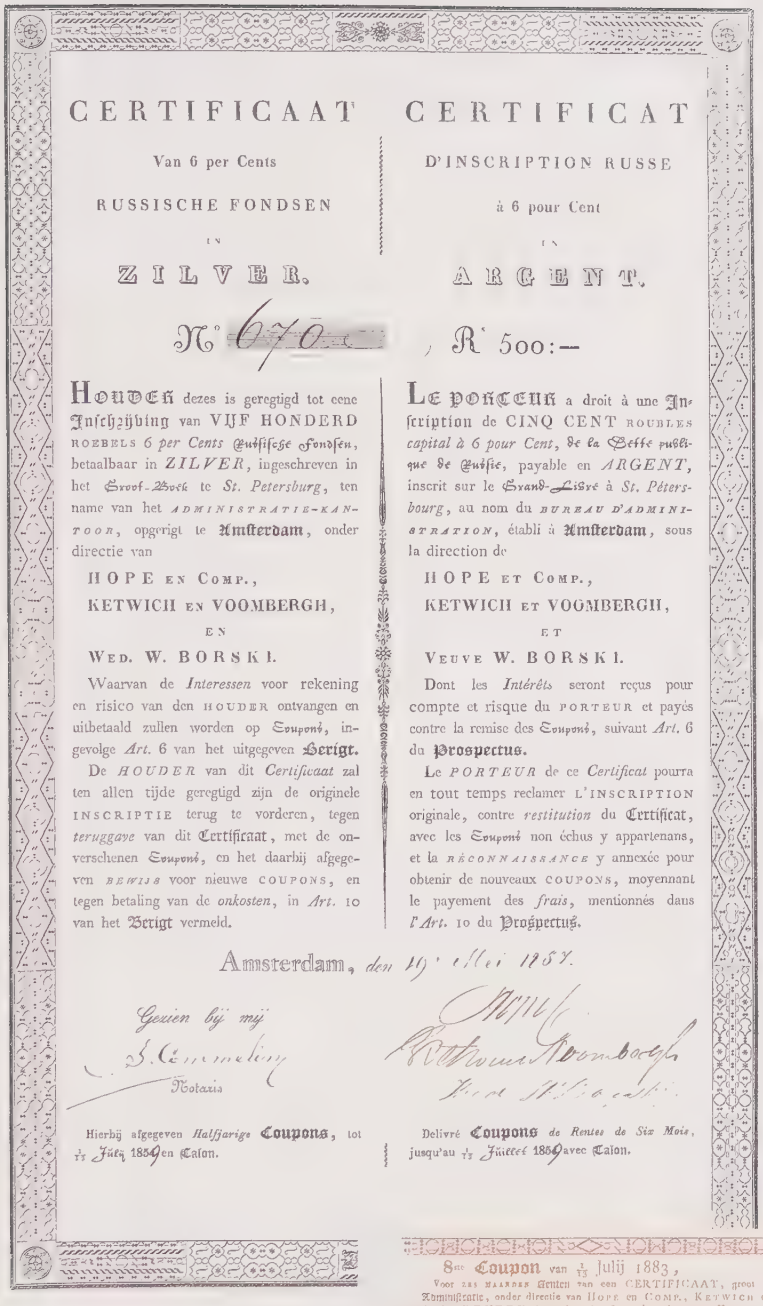
By the end of the eighteenth century Hope & Co. had become the principal banker raising money for the Russian czar in Holland. In addition to directly issuing bonds on behalf of the czar, the firm also helped to popularize a mechanism for small investors to participate in inscriptions in the Russian book of public debt. The Office of Administration of Hope, Van Ketwich, Voomberg, and Widow W. Borski, founded in 1824,[15] took foreign inscriptions in its name and offered "certificates," or depository receipts, backed by these inscriptions to the Dutch public. In return for a small fee, the firm would administer the collection of interest payments abroad, which would be passed on to the certificate holders upon presentation of the coupons attached to the certificates. The added advantage of the depository receipts was that they were freely tradable in bearer form in Amsterdam, thereby circumventing the registration requirements of the original inscriptions. If desired, investors could always tender the depository certificates to the administration office in exchange for an original inscription in the foreign book of public debt. To further alleviate investor concerns, the certificates explicitly specified that the administrators would keep the original inscriptions in "an



iron safe, with three different working keys, one of which would remain in the hands of a notary public."

While depository receipts were initially created to facilitate trade in foreign government debt, their presence became widespread in the Amsterdam stock market in the second half of the nineteenth century. Their application economized on onerous registration requirements associated with the trading of American railroad stocks, which required transfer in the company books, and the collection of foreign dividends. In 1863 the firm of Boissevain and Teixeira de Mattos set up an Office of American Railroad Stocks to purchase shares in Illinois Central Railroad Company. The original shares were deposited with a notary public, against which the office issued "Certificates Illinois Central Railroad Company" in portions of one, five, or ten shares. The certificates were freely negotiable in bearer form, and they contained coupons for collecting the dividends that would accrue on the original shares. Transfer of certificate ownership did not require transfer in the company books in the U.S., because the administration office remained the owner of record, although investors retained the right to request that the original shares be placed in their names upon the tendering of the depository receipt.

To accommodate foreign investors, some American companies managed a transfer book for their shares in London—but never in Amsterdam, probably due to the widespread use of depository receipts. When J. P. Morgan introduced American Depository



CERTIFICAAT

Van 6 per Cents

RUSSISCHE FONDSEN

IN

ZILVER.

N° 670

HOUDER dezes is geregtigd tot eene Inschrijving van VIJF HONDERD ROEBELS 6 *per Cents* Russische Fondsen, betaalbaar in *ZILVER*, ingeschreven in het Groot-Boek te *St. Petersburg*, ten name van het *ADMINISTRATIE-KANTOOR*, opgerigt te **Amsterdam**, onder directie van

HOPE EN COMP.,
KETWICH EN VOOMBERGH,
EN
WED. W. BORSKI.

Waarvan de *Interessen* voor rekening en risico van den HOUDER ontvangen en uitbetaald zullen worden op Coupons, ingevolge *Art.* 6 van het uitgegeven **Berigt.**

De *HOUDER* van dit *Certificaat* zal ten allen tijde geregtigd zijn de originele INSCRIPTIE terug te vorderen, tegen *teruggave* van dit **Certificaat**, met de onverschenen Coupons, en het daarbij afgegeven *BEWIJS* voor nieuwe COUPONS, en tegen betaling van de *onkosten*, in *Art.* 10 van het **Berigt** vermeld.

CERTIFICAT

D'INSCRIPTION RUSSE

à 6 pour Cent

EN

ARGENT.

R. 500:—

LE PORTEUR a droit à une Inscription de CINQ CENT ROUBLES *capital à 6 pour Cent*, de la Dette publique de Russie, payable en *ARGENT*, inscrit sur le Grand-Livre à *St. Pétersbourg*, au nom du *BUREAU D'ADMINISTRATION*, établi à **Amsterdam**, sous la direction de

HOPE ET COMP.,
KETWICH ET VOOMBERGH,
ET
VEUVE W. BORSKI.

Dont les *Intérêts* seront reçus pour compte et risque du PORTEUR et payés contre la remise des Coupons, suivant *Art.* 6 du **Prospectus.**

Le *PORTEUR* de ce *Certificat* pourra en tout temps reclamer L'INSCRIPTION originale, contre *restitution* du **Certificat**, avec les Coupons non échus y appartenans, et la *RÉCONNAISSANCE* y annexée pour obtenir de nouveaux COUPONS, moyennant le payement des *frais*, mentionnés dans *l'Art.* 10 du **Prospectus.**

Amsterdam, den 19e Mei 1857.

Gezien bij mij
J. Cammelin
Notaris

Hierbij afgegeven *Halfjarige* **Coupons**, tot 1/13 Julij 1859 en Talon.

Delivré **Coupons** de *Rentes de Six Mois*, jusqu'au 1/13 Juillet 1859 avec Talon.

Opposite: *1854 inscription in the Russian book of public debt in the name of the administration office of Hope, Ketwich, Voomberg, and Wed W. Borski.*

Left and below: *1857 depository receipt on Russian debt* (left) *by Hope and Co., Ketwich and Voomberg, and Wed W. Borski, with unredeemed coupons* (below) *from July [1], 1883.*

8ste **Coupon** van 1/13 Julij 1883, Groot Rs. 15:-, in **Zilver** N°. 670

Voor zes maanden Renten van een CERTIFICAAT, groot *Rs.* 500 - 6 *per Cents*, Russische Fondsen, ingeschreven ten name van het Kantoor van Administratie, onder directie van HOPE en COMP., KETWICH en VOOMBERGH, en Wed. W. BORSKI, te Amsterdam, betaalbaar in *inkomst* van dezelve *RENTEN*, ingevolge *Art.* 6 van het uitgegeven Berigt.

9de **Coupon** van 1/13 Januarij 1884, Groot Rs. 15:-, in **Zilver** N°. 670

Voor zes maanden Renten van een CERTIFICAAT, groot *Rs.* 500:- 6 *per Cents*, Russische Fondsen, ingeschreven ten name van het Kantoor van Administratie, onder directie van HOPE en COMP., KETWICH en VOOMBERGH, en Wed. W. BORSKI, te Amsterdam, betaalbaar in *inkomst* van dezelve *RENTEN*, ingevolge *Art.* 6 van het uitgegeven Berigt.

10de **Coupon** van 1/13 Julij 1884, Groot Rs. 15:-, in **Zilver** N°. 670

Voor zes maanden Renten van een CERTIFICAAT, groot *Rs.* 500 - 6 *per Cents*, Russische Fondsen, ingeschreven ten name van het Kantoor van Administratie, onder directie van HOPE en COMP., KETWICH en VOOMBERGH, en Wed. W. BORSKI, te Amsterdam, betaalbaar in *inkomst* van dezelve *RENTEN*, ingevolge *Art.* 6 van het uitgegeven Berigt.

BEWIJS ter bekoming van *NIEUWE COUPONS* na 1/13 *Julij* 1884, voor het **Certificaat** N°. 670 van *Rs.* 500:- 6 *per Cents* Russische Fondsen in *Zilver*, onder Administratie van HOPE en COMP., KETWICH en VOOMBERGH, en Wed. W. BORSKI, te Amsterdam

Na gedane aankondiging zal tegen intrekking dezes, tot 1/13 *Julij* 1886 en later *niet*, aan den HOUDER dezes, zonder berekening van KOSTEN, worden afgegeven, een Stel van TIEN HALFJARIGE COUPONS, voor het bovenstaande Certificaat, waarvan de eerste verschijnen zal 1/13 *January* 1885. Zullende mitsdien deze *aanneming* na 1/13 *Julij* 1886 geheel zijn vervallen en van *Onwaarde*, en het Kantoor van Administratie geregtigd zijn, om het niet afgehaalde Stel NIEUWE COUPONS alsdan afgegeven, van den Houder van het *Certificaat* zelve.

D. & R. G. R. M.

Denver & Rio Grande Spoorweg-Maatschappij.

(PREFERRED STOCK.)

CERTIFICAAT van $ 1000,

N°. 669

Houder dezes is gerechtigd tot **Tien bevoorrechte Aandeelen à $ 100.—** in de Denver & Rio Grande Spoorweg-Maatschappij (Preferred Stock), MET MEER ANDERE INGESCHREVEN OP NAAM VAN DE MAATSCHAPPIJ TOT BEHEER VAN HET ADMINISTRATIE-KANTOOR, OPGERICHT DOOR HUBRECHT, VAN HARENCARSPEL & VAS VISSER, en gedeponeerd bij den ondergeteekenden Notaris.

De uitdeelingen op de gedeponeerde Aandeelen zullen voor rekening van den houder in Amerika gecasseerd, overgemaakt en alhier uitbetaald worden.

De inwisseling van Certificaten met de onvervallen Dividend-Bewijzen tegen de oorspronkelijke Aandeelen geschiedt overeenkomstig het Bericht door bovenvermeld Administratie-Kantoor, uitgegeven in December 1880.

Amsterdam, 8 December 1886

Gezien door mij, Notaris.

De Maatschappij tot beheer van het Administratie-Kantoor voornoemd:

Hierbij afgegeven Dividend-Bewijzen van No. / tot No. 24, met een Talon.

D. & R. G. R. M.

Gedrukt bij Gebroeders Kruyer, Amsterdam

THE ROCK ISLAND COMPANY.

CERTIFICAAT van $ 1000.-

COMMON STOCK.

N°. 52108

HOUDER dezes is gerechtigd tot TIEN GEWONE AANDEELEN à **$ 100.-** in The Rock Island Company, onder meer ingeschreven op naam van de **Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen**, opgericht door:

BROES en GOSMAN,
TEN HAVE en VAN ESSEN
en
JARMAN en ZOONEN,
TE AMSTERDAM,
en gedeponeerd bij den ondergeteekenden Notaris.

De **UITDEELINGEN** op de *gedeponeerde aandeelen* zullen voor rekening en risico van den **HOUDER** in *America* ontvangen, overgemaakt en alhier uitbetaald worden.

De inwisseling van CERTIFICATEN met onvervallen Dividend-bewijzen, tegen de oorspronkelijke Aandeelen, kan geschieden overeenkomstig bericht dato 1 *October* 1897.

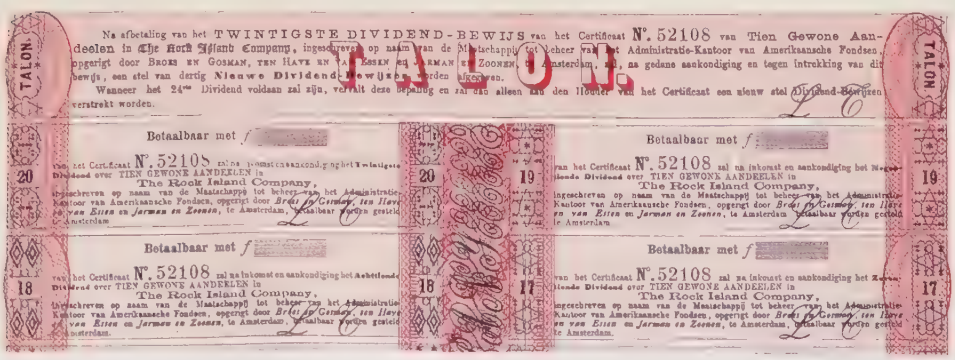
Amsterdam,

Gezien door mij

Maatschappij tot beheer van het Administratie-Kantoor voornoemd,

Notaris.

Hierbij afgegeven Dividend-bewijzen van tot 20, met TALON.



TALON.

Na afbetaling van het TWINTIGSTE DIVIDEND-BEWIJS van het Certificaat N°. 52108 van Tien Gewone Aandeelen in The Rock Island Company, ingeschreven op naam van de Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen, opgericht door BROES EN GOSMAN, TEN HAVE EN VAN ESSEN en JARMAN EN ZOONEN, te Amsterdam, zal, na gedane aankondiging en tegen intrekking van dit bewijs, een stel van dertig **Nieuwe Dividend-Bewijzen** worden uitgereikt.

Wanneer het 24ste Dividend voldaan zal zijn, vervalt deze bepaling en zal dan alleen aan den Houder van het Certificaat een nieuw stel Dividend-Bewijzen verstrekt worden.

1906

Betaalbaar met / — 20

van het Certificaat N°. 52108 zal na inkomst en aankondiging het Twintigste Dividend over TIEN GEWONE AANDEELEN in The Rock Island Company, ingeschreven op naam van de Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen, opgericht door *Broes en Gosman, ten Have en van Essen* en *Jarman en Zoonen*, te Amsterdam, tegen gelijk bedrag in goud uitbetaald worden te Amsterdam

Betaalbaar met / — 19

van het Certificaat N°. 52108 zal na inkomst en aankondiging het Negentiende Dividend over TIEN GEWONE AANDEELEN in The Rock Island Company, ingeschreven op naam van de Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen, opgericht door *Broes en Gosman, ten Have en van Essen* en *Jarman en Zoonen*, te Amsterdam, tegen gelijk bedrag in goud uitbetaald worden te Amsterdam

Betaalbaar met / — 18

van het Certificaat N°. 52108 zal na inkomst en aankondiging het Achttiende Dividend over TIEN GEWONE AANDEELEN in The Rock Island Company, ingeschreven op naam van de Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen, opgericht door *Broes en Gosman, ten Have en van Essen* en *Jarman en Zoonen*, te Amsterdam, tegen gelijk bedrag in goud uitbetaald worden te Amsterdam

Betaalbaar met / — 17

van het Certificaat N°. 52108 zal na inkomst en aankondiging het Zeventiende Dividend over TIEN GEWONE AANDEELEN in The Rock Island Company, ingeschreven op naam van de Maatschappij tot beheer van het Administratie-Kantoor van Amerikaansche Fondsen, opgericht door *Broes en Gosman, ten Have en van Essen* en *Jarman en Zoonen*, te Amsterdam, tegen gelijk bedrag in goud uitbetaald worden te Amsterdam

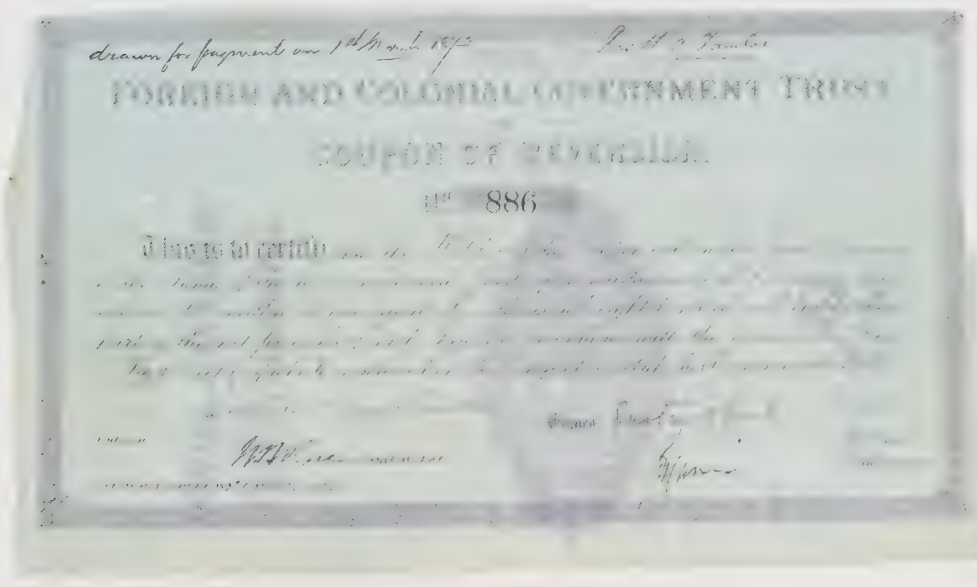
Depository receipts on American railroads in Amsterdam. 1886 and 1913. Receipts for ten shares of preferred stock in the Denver and Rio Grande Railway, and ten shares of common stock in the Rock Island Railroad.

Receipt (ADR) on the British retailer Selfridge's in the United States in 1927, the bank could build on more than a century of European experience.

Nineteenth-Century Mutual Funds

The first investment trust outside of the Netherlands is the *Foreign and Colonial Government Trust*, founded in 1868 in London. Like *Eendragt Maakt Magt*, it invested in foreign government bonds. According to its prospectus, the goal was to provide "the investor of moderate means the same advantages as the large capitalist, in diminishing the risk of investing in foreign and colonial government stocks, by spreading the investment over a number of different stocks." It was modeled after the Dutch trusts in the sense that investment income was projected to exceed dividends, and excess income would be used to liquidate shares over its projected twenty-four-year life. By 1875 eighteen trusts had been formed in London.[16] It was during this period that the Scotsman Robert Fleming started his famous first trust, investing in U.S. railroad bonds, later named the First Scottish American Investment Trust. During the 1890s, investment trusts were introduced into the United States. Most of the early U.S. investment trusts were closed-end funds, like *Eendragt Maakt Magt*, issuing a fixed number of shares. The issue of new shares, or repurchases, were not precluded but were infrequent. Moreover, the repurchase or issue price was not necessarily proportional to the intrinsic value of the underlying portfolio.

This changed in 1924, when the Massachusetts Investors Trust became the first U.S. mutual fund with an open-end capitalization, allowing for the continuous issue and redemption of shares by the investment company at a price that is proportional to the value of the underlying investment portfolio. Open-end capitalization has become the dominant model for mutual fund organization, suggesting that it has been an important innovation contributing to its modern success. One cannot fail to be surprised, however, by how many of the features of eighteenth-century investment funds have survived until today.



Foreign and Colonial Government Trust coupon of reversion. The First British mutual fund contained a sinking fund similar to the early Dutch mutual funds. At the end of the scheduled twenty-four-year life of the trust, after all shares were redeemed, any remaining value of the fund would be divided among its investors, who could be paid by tendering this coupon of reversion.

16

Transatlantic Paper and the Emergence of the American Capital Market

NED W. DOWNING

Founding Fathers Robert Morris, Benjamin Franklin, Francis Hopkinson, Alexander Hamilton, and other early American patriots designed and used a variety of paper financial instruments to fund the Revolutionary War (1775–83) and then, six years, later to refinance the resulting debt. This chapter discusses most of those financial instruments that were used internationally. Almost all of the rest of the financial instruments used in the Revolution circulated primarily in the states where they were issued. The use of transatlantic paper reveals the emergence of the United States first as an international loan seeker, and soon thereafter as an overextended and nearly bankrupt borrower. Only later did the country become the issuer of prime investment-grade securities that were in demand by financiers and investors throughout the world.

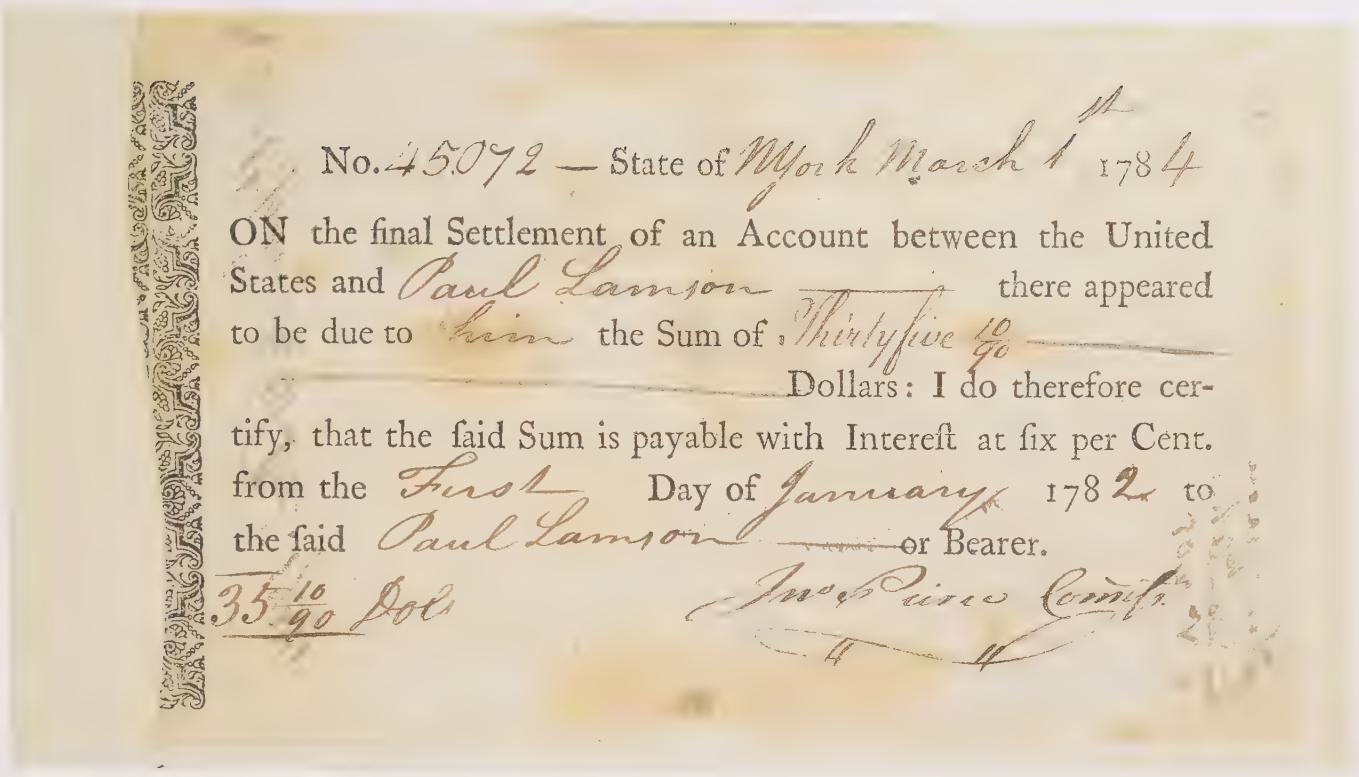
The American capital markets as we know them today were born during this transition from defaulted borrower to prime credit. These markets combined an unparalleled capital allocating ability with the confidence-inspiring first Federal Congress's new constitutional system of laws and government. The discussion below provides insight into this development and tells the story of American capital market firsts—the first U.S. debt securities, the first public offering of a stockholder owned company, the first securities brokers, the first regular securities markets, the first official foreign exchange instruments, the first

international investment bankers, the first and only outright default of a U.S. debt security, the first public investment funds to invest in U.S. securities, the first market panic, the first securities exchange of cooperating brokers, and the first U.S. securities to be recognized worldwide as prime investment grade. Indeed, this chapter offers not only salient examples for interpreting the origins of the American capital market but also a fresh perspective on early U.S. history.

No one who has studied the financing of the Revolutionary War can fail to recognize the unlikely American victory. Without timely French financial and military assistance the war's outcome would have been far different. Expedience rather than sound policy increasingly dictated American financial strategy as the Revolutionary War continued past 1776, especially from 1781 to 1784, when Robert Morris was superintendent of finance. Congress abused the securities created to finance the war by overissuing continental currency without providing a means of repayment, failing to develop initiatives to honor those financial commitments that they made, and pursuing flawed strategies. In desperation Congress even drew on nonexistent foreign loans—sullying her own credit. Morris delivered his own abuse by continually overdrafting the French, Dutch, and Spanish loans raised in Europe by American foreign envoys and by manipulating and speculating with securities for the benefit of the United States. Morris's continued private business activities while he was superintendent of finance undermined his public support and the effectiveness of his administration. By the time the states had repeatedly failed to agree on a confederation financial plan after the American military victory at Yorktown in 1781, the securities used to finance the war had lost much of their value. The American economy stagnated from 1783 to 1788 overburdened by the unresolved state and U.S. Revolutionary War debt issues. Then from 1789 to 1790, aided by the more flexible powers contained in the new Constitution, Treasury Secretary Alexander Hamilton prepared and implemented what proved to be a prescient plan to restore the public credit. The credit reestablished U.S. financial credibility and, ultimately, made her securities the most liquid and respected in the world.

Scholars seldom study the original financial instruments that accommodated the early transatlantic relationships between the United States and her allies—France, Holland, and Spain—during the Revolutionary War and in the postwar period. The story behind these transatlantic securities illuminates the primary causes of the growing financial paralysis of the American government from 1778 to 1789. Most original examples were either destroyed after usage or burned in subsequent Treasury fires and in the British invasion of Washington in the War of 1812, or were intentionally thrown out during the Civil War to make room in the nation's capitol for a hospital for wounded Northern soldiers. Their rarity and resulting obscurity has confounded scholarly and institutional efforts to form and study a definitive reference collection.[1] It is the author's hope that this chapter will encourage further study and debate by providing a substantive illustrated reference and detailing some previously unreported observations.

Ironically, the most important transatlantic securities in the postwar period were not those specifically designed for transatlantic remittances. Rather they were the badly beaten down and low priced 6 percent United States and state final settlement certificates[2] and 6 percent Continental Loan Office Certificates,[3] which were purchased in the United States between 1783 and 1790 by domestic speculators and international investors and arbitrageurs at great discounts. The near bankrupt status of the United States after the war caused some of these securities to trade at prices as low as 5 to 10 cents on the dollar.[4] Some budding American financial entrepreneurs saw the low price as



No. 45072 — State of New York March 1st 1784

ON the final Settlement of an Account between the United States and Paul Lamson there appeared to be due to him the Sum of Thirty five 10/90 Dollars: I do therefore certify, that the said Sum is payable with Interest at six per Cent. from the First Day of January 1782 to the said Paul Lamson or Bearer.

35 10/90 Dols

Jno Pierce Comr.

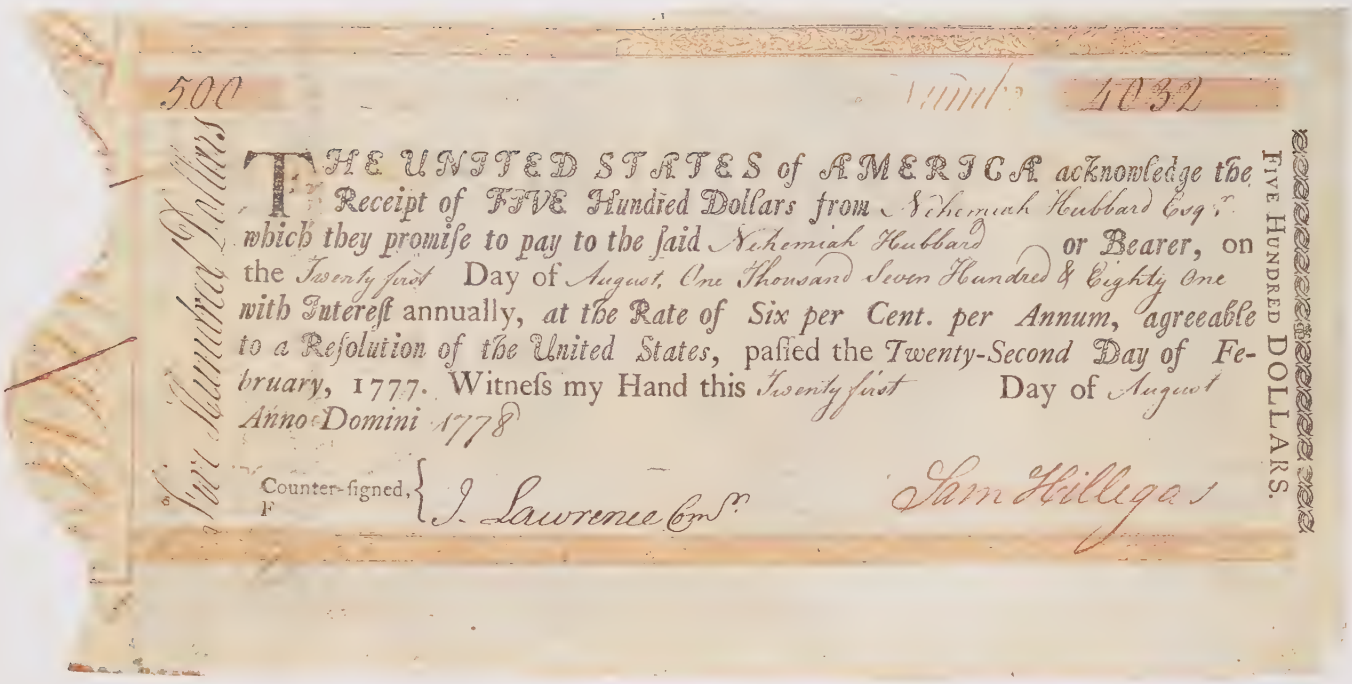
United States 6 percent final settlement certificate, signed by Commissioner John Pierce. March 1, 1784. Final settlement certificates ("finals") from the United States and the thirteen original states similar to this example formed the largest tradable corpus of Revolutionary War debt. They became the object of domestic speculators and international investors/arbitrageurs as their price dipped, sometimes as low as 5 cents on the dollar in the 1783–1789 postwar period.

This certificate was given to Paul Lamson for his service in the Continental Army. The soldiers were rarely paid, and they had to wait for years after the war to settle their claims. It wasn't until 1791 that the certificates were valued enough in the marketplace to sell for 100 cents on the dollar. Soldiers or their families who held on to the final settlement certificates and exchanged them for the three classes of stock in the public funds offered under Hamilton's 1790 plan eventually received all the money owed to them plus interest.

Commissioner John Pierce, who was in charge of valuing soldiers' claims and issuing the finals, later partnered with Boston broker Andrew Craigie and others to buy up the low-priced certificates. They positioned themselves to resell the finals to foreign investors, mostly to Dutch trusts set up to sell to the Dutch and Flemish public. Craigie was also Daniel Parker's broker in the United States after Parker fled to Europe with U.S. funds provided by Robert Morris and intended for a U.S. army supply contract.

an opportunity and they sought out and created a better market in Europe. There the securities were marked up significantly, repackaged, and sold to the Dutch public who were then actively seeking alternative investments for their funds.[5] When these investments were strongly supported by the first Federal Congress and Treasury Secretary Alexander Hamilton, they quickly proved to be dollar good and traded up to 100 cents on the dollar and more. This was a turning point in the history of U.S. credit.

Then international capital began to flow in earnest into the three classes of securities (see example p. 296) that were exchanged for the Revolutionary War debt claims (finals, liquidated debt securities, Continental Loan Office Certificates, and so forth) from 1789 to 1793 under Secretary of the Treasury Alexander Hamilton's plan to restore the public credit. Nearly $65 million worth of securities provided the corpus around which the American capital markets, nearly as we know them today, began to trade. By mid-1803 foreigners owned nearly 50 percent of these securities.


500 Dollars

No. 4032

THE UNITED STATES of AMERICA acknowledge the Receipt of FIVE Hundred Dollars from Nehemiah Hubbard Esqr. which they promiſe to pay to the ſaid Nehemiah Hubbard or Bearer, on the Twenty first Day of August, One Thousand Seven Hundred & Eighty One with Intereſt annually, at the Rate of Six per Cent. per Annum, agreeable to a Reſolution of the United States, paſſed the Twenty-Second Day of February, 1777. Witneſs my Hand this Twenty first Day of August Anno Domini 1778

Counter-signed, J. Lawrence Comr.

Sam Hillegas

FIVE HUNDRED DOLLARS.

$500 continental loan office certificate (CLOC) #4032. When the first $5 million issue of 4 percent CLOCs failed to sell, the return was raised to 6 percent on February 22, 1777, which was the authorization date for this security (issued on August 21, 1778, to Deputy Quartermaster General Nehemiah Hubbard). Because it was issued after March 1, 1778, the interest payments were denominated in continental currency. Had it been issued before March 1, interest payments would have been made in CLOBOEs. (CLOCs issued prior to March 1, 1778, were ultimately repaid 100 cents on the dollar.) Either way it is part of the first $5 million U.S. loan.

Congress further depreciated the credit of the United States by using these debt instruments like currency to pay for war goods, rather than borrowing money. In fact, the initial purpose of CLOCs makes little sense to present-day financiers. Congress designed CLOCs to sop up the oversupply of continental currency, which had begun to lose value due to near continuous issue. They reasoned that potential buyers would exchange their non–interest bearing continental currency for the 6 percent obligations, especially when the continental currency was allowed to be valued at par in payment. In truth, after March, 1778, the use of CLOCs to pay for supplies continued to undermine the credit of the United States. Congress later tried to make the security more valuable by linking the rate paid with the growth of the supply of continental currency, but the public wasn't buying. They had lost confidence in Congress's ability to manage its finances and the value of CLOCs sank as low as 5 cents on the dollar.

The CLOC above is signed by Sam Hillegas, son of U.S. treasurer of loans Michael Hillegas, and by John Lawrence, Connecticut commissioner of the Continental Loan Office. The record of interest payments on verso indicates how the instrument was used. This one has a note on the indent "Amount in specie 131 30/90," possibly indicating that this cash amount was used with the balance in supplies in exchange for the $1781.

Revolutionary Background: Continental Currency

To understand the genesis of American transatlantic paper—those securities that were used internationally—it is helpful to first understand continental currency. The first official American transatlantic paper was a bill of exchange payable in cash in France that was designed to be an optional continental currency substitute for interest payments on the first U.S. debt issues. Continental currency emerged as the war financing method of choice as fighting in the Revolutionary War broke out.

When "the shot heard round the world" was fired on Lexington Green the morning of April 19, 1775, the United States technically did not exist. Representatives of twelve of the original thirteen independent British colonies that eventually became the United States had voluntarily gathered in 1774 at Carpenter's Hall in Philadelphia to form a

Continental Congress to deliberate on their grievances against the British.[6] This Congress reformed on May 10, 1775, and even though it was specifically designed to be only a deliberative body, on June 22 resolved on its own authority to emit $2 million worth of continental currency[7] for the defense of America. Unfortunately for subsequent financiers, the news of the June 17 Battle of Bunker Hill arrived at the Continental Congress before the ways and means of repayment of this continental currency issue was decided. A short war was generally expected and apparently a tacit agreement was made for the twelve[8] colonies to repay the continental currency in silver in seven years—each colony to repay an amount in proportion to its population. By the time the first $2 million issue had been printed it was already spent, and another $1 million[9] was authorized on July 25. Then Congress articulated that each colony should provide its own ways and means to redeem the continental currency in four equal installments payable November 30, 1779, 1780, 1781, and 1782. Each colony's proportion of the $3 million was noted according to their then estimated population statistics, and these figures were to be used until a census could provide definitive population numbers.[10] Later, on October 14, 1777, when Congress fleshed out a new, hopefully more efficient, Articles of Confederation government, it decided to apportion expenses according to land values with improvements (as opposed to the population basis). "This decision . . . was destined to rise up to plague Congress in the days to come."[11]

First United States Debt Issue: Continental Loan Office Certificates

Congress continued through most of 1776 to rely domestically on continental currency with nearly continuous new and larger issues, causing the people using it to begin to doubt its ultimate repayment. By mid-1776 the paper currency began to fall in value relative to the value of a Spanish milled dollar, into which it was convertible after 1779.[12] Congress realized it needed to reduce the overhanging supply of continental currency and to diversify its sources of funding. On October 3, 1776, it resolved to borrow $5 million at 4 percent interest by issuing three-year Continental Loan Office Certificates (CLOCs) and selling them through loan officers domiciled in each state. They also designed a $10 million U.S. lottery using the CLOCs as prizes. The original $5 million CLOC offering was the first U.S. debt issue, an obligation of all thirteen colonies together.[13] Legislation specified "that the faith of the United States be pledged to the Lenders for the payment of the sums to be borrowed, and the interest arising thereon, and that certificates be given to the lenders."[14] This guarantee was given to holders by the Continental Congress by relying on the states' future willingness and ability to provide required funds at redemption. Neither the Continental Congress nor its Articles of Confederation successor in 1781, the Confederation Congress, had the authority to raise funds via taxation. This prerogative was left solely to the states. Congress assumed the states would honor their tax requisitions. Financially this strategy was expedient but it ultimately proved dysfunctional.

CLOCs sold slowly at first, primarily based on their patriotic appeal. Even after their interest rate was raised to 6 percent on February 22, 1777, only $4,011,544 sold through September 19, 1777.[15] When Congress raised the rate to 6 percent it showed good faith and agreed to pay that rate as well to all previous 4 percent subscribers. But 6 percent was not enough of a return to attract needed funds. Congress eventually thought it had found the proper formula internationally using funds developed by foreign envoys and allies.

Transatlantic Paper: The First Official American Foreign Exchange Instrument "for Interest Due on Money Borrowed by the United States"

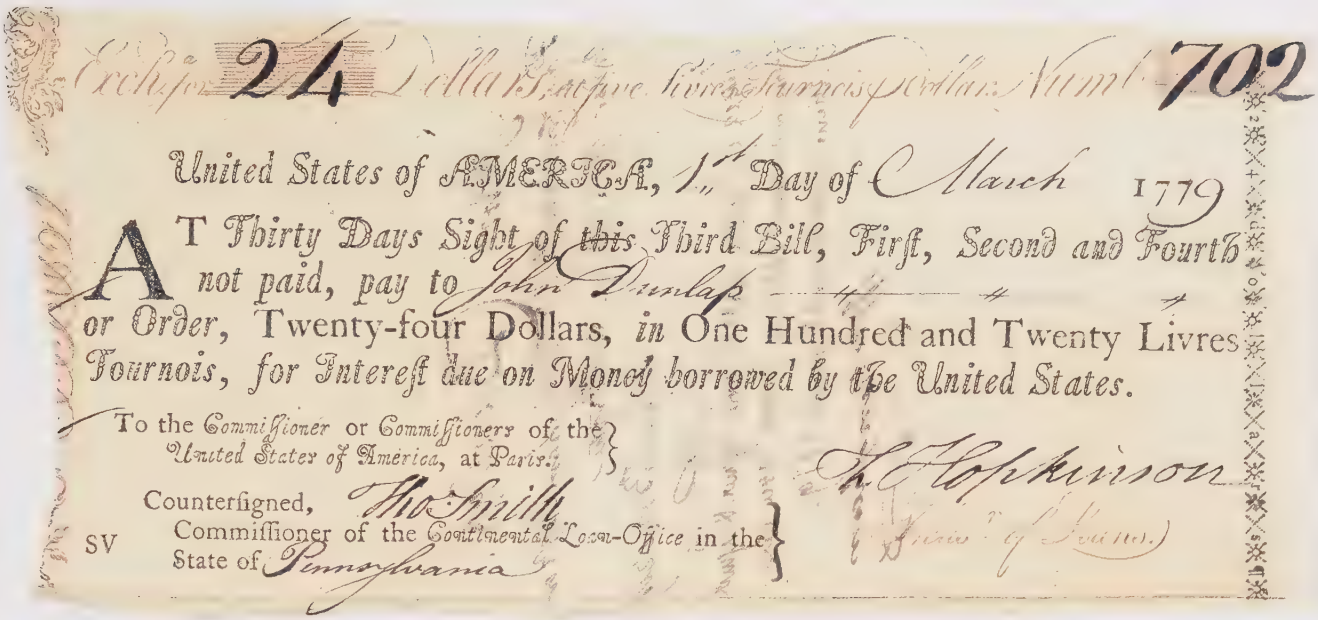
Congress sent emissaries to potential foreign allies to scout out monetary and military assistance. As early as September of 1775[16] the French diplomatic spy Julien de Bonvouloir[17] had made contact with Benjamin Franklin in the United States and indicated the possibility of secret French assistance for the American cause. Bonvouloir brought back to the French court an overly optimistic but convincing story of a large, resolute, and well-trained army ready in the United States to take on the British. France was still smarting from their defeat at the hands of the British in the earlier French and Indian War. With further impetus from the French adventurer, playwright,[18] and friend to America, Pierre Beaumarchais, King Louis XVI embraced the strategy of clandestinely supplying the American insurgents as a productive means of preoccupying their British enemy while they rebuilt their navy and further prepared for war. In January 1776 Congress appointed Silas Deane commercial and political agent for the United States in Europe and sent him there to purchase arms, clothing, and transportation for supply of 25,000 soldiers.[19] In September, Benjamin Franklin and Silas Deane (Arthur Lee, then in London, was added in October) were elected "Commissioners of the United States to France." Franklin arrived in France on December 8 and found monetary and military supply plans well advanced by Deane and Beaumarchais.

In a January 17, 1777, letter Franklin and the other commissioners reported to the Committee of Secret Correspondence a remarkable development from France. The commissioners had struck an agreement with the Farmers General, the influential and rich syndicate charged by the king with French tax collecting authority, to sell them 20,000 hogsheads of tobacco at a fair price. In return

> we are offered a loan of two millions of livres, without interest, and to be repaid when the United States are settled in peace and prosperity. No conditions or securities are required, not even an engagement from us. . . . Five hundred thousand livres, or one quarter, is to be paid into the hands of our banker this day, and five hundred thousand more each three months. . . . this seems to us a fair opportunity a/supporting the credit of the paper money you borrow, as you may promise payment in specie of the interest, and you may draw upon us for the same with all confidence."[20]

Julien de Bonvouloir's report from his spy mission to the United States paved the way for adopting the French strategy of clandestinely assisting the American cause. Pierre Beaumarchais, the son of a watchmaker who married well, effectively used his position in the Court of Louis XVI to convince the king's ministers[21] and the king that providing this aid to the Americans was sound French policy. Much of the aid from the king's stores was delivered by Rodrique Hortalez & Company, a fictitious trading company created by Beaumarchais to hide the king's largess to the Americans from sight of the British.[22]

In a March 12, 1777, letter from the Paris commissioners, they "advise Congress to draw on us for sums equal to the interest of what they have borrowed, as that interest becomes due, allowing the lenders, in the drafts, 5 livres, money of France, for every dollar of interest."[23] They implied that Louis XVI had agreed to pay the interest on the American war debt. This advice was the genesis for the first official American transatlantic foreign exchange instrument, the Continental Loan Office Bill of Exchange (CLOBOE). CLOCs initially made their interest payments in continental currency, which began de-



Exch. for 24 Dollars, at five Livres Tournois p. Dollar. Numb. 702

United States of AMERICA, 1st Day of March 1779

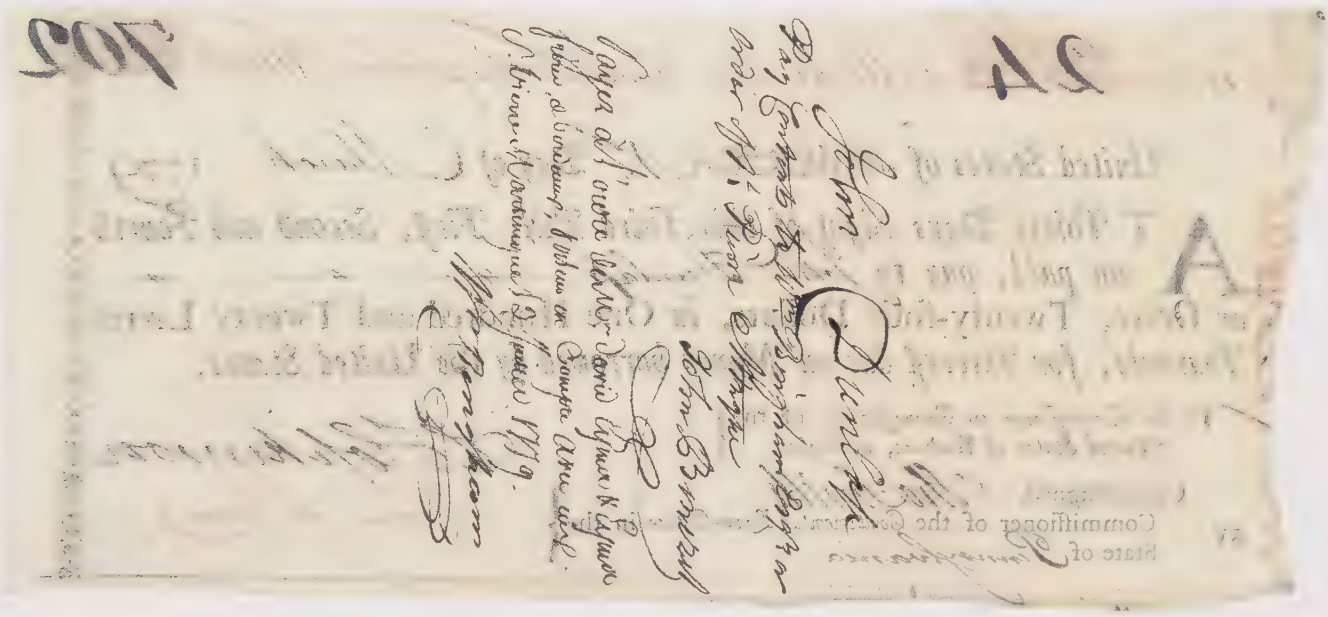
AT Thirty Days Sight of this Third Bill, First, Second and Fourth not paid, pay to John Dunlap or Order, Twenty-four Dollars, in One Hundred and Twenty Livres Tournois, for Interest due on Money borrowed by the United States.

To the Commissioner or Commissioners of the United States of America, at Paris.

Countersigned, Tho. Smith
Commissioner of the Continental Loan-Office in the State of Pennsylvania

SV

Fr. Hopkinson
Treasr. of Loans.



$24 or 120 livres Tournols *Continental Loan Office March 1, 1779, third bill of exchange (CLOBOE).* CLOBOEs were designed to pay Revolutionary War debt–holders their interest in French cash granted by French King Louis XVI. This specimen is made to and signed on the verso by John Dunlap, the Philadelphia printer of the Declaration of Independence. It was apparently used to fund the triangle war trade between the United States and France, as it is also endorsed by William Bingham, U.S. secret agent in Martinique, after being first endorsed by Dunlap over to John Benezet, a Philadelphia relative and business partner of Bingham's. It is also signed by Francis Hopkinson, as treasurer of loans, and Thomas Smith, as Continental Loan Office commissioner from Pennsylvania.

clining in value and made the CLOC security less desirable than one that paid specie interest. Accordingly, as a sales inducement, Congress resolved that any CLOCs purchased after September 9 and before March 1, 1778, would receive at its holder's option interest payments in specie (cash) via a CLOBOE.[24] On the face of each CLOBOE the exchange rate was fixed at 5 livres per dollar (meaning a Spanish milled silver dollar, not a continental currency dollar), a rate which was somewhat less than the approximate 5.4 livres per

one Spanish milled dollar rate that existed in France in 1777. The rate of 5 livres per dollar was suggested by the commissioners to make the CLOBOEs more negotiable at the point of redemption in France. Congress devised a series of CLOBOEs in denominations of 12, 18, 24, 30, 36, 60 120, 300, 600, and 1,200 dollars to draw "Interest due on Money borrowed by the United States."[25]

Congressional financiers carefully designed the CLOBOEs, knowing that they would be the first security of the United States to be presented for collection to their allies abroad. On August 20, 1776, they had Nathan Sellers of Darby, Pennsylvania, released from military duty at the request of the papermakers who had previously employed him. Sellers understood the complicated watermarking process for the safety paper which Congress ordered for their CLOCs and CLOBOEs.[26] The watermarking process was an effective anticounterfeiting device, and counterfeiting was a major problem for early American paper money issuers. CLOBOEs were issued in sheets of four containing a first, second, third, and fourth bill of exchange. The CLOBOEs were watermarked UNITED STATES 1, 2, 3, or 4, with the number corresponding to the number of the bill. So many ships were either detained or lost at sea that almost all important letters and documents were sent in duplicate, triplicate, or more via different vessels. To prevent double payment when any of the four bills were accepted for payment, all others of the series were deemed null and void. Careful accounting records were required to make this system work properly. First bills (CLOBOEs) were unknown to collectors in 1983 when *The Price of Liberty* by William Anderson was published.[27] Since then a small number have surfaced. Several of the newly discovered first bills were endorsed by Jonathan Williams, Benjamin Franklin's nephew and commercial agent for the United States at Nantes, the port of entry for most of the American tobacco and produce shipments to France. Some of the most interesting CLOBOEs are endorsed by William Bingham,[28] America's secret agent in Matinique and fulcrum for the extensive triangle war goods trade centered there between the United States and France. Francis Hopkinson, the Pennsylvania signer of the Declaration of Independence, presigned each CLOBOE, which was then countersigned by the respective state continental loan officer at the time of issue. Nathan Sellers created individual wire molds for producing the watermarks. The damp pulverized and pressed rag pulp was spread over these molds before it was placed on racks to dry. Mark Wilcox of Chester County was most likely the papermaker employed for the secret process.[29] The resulting bills have an official-looking appearance, and many of those still in collectors' hands appear fresh and bright.

The First Regular American Securities Markets and Brokers

Ironically, the periodic appearance of transatlantic securities (CLOBOEs) in the U.S. marketplace created the impetus for the first regular American securities markets. Each CLOBOE was directed to the "Commissioner or Commissioners of the United States at Paris" for collection of the sum designated on the face of the bill "for interest due on Money borrowed by the United States." Having to send the bills to Europe for collection hindered rather than helped Congress's effort to make the CLOCs a more attractive investment vehicle. Few individuals had the wherewithal or confidence to send a security instrument across the ocean for collection to unknown "Commissioners" and then wait for the specie to be returned via another dangerous ocean crossing voyage. Into this void stepped the country's first securities brokers such as Haym Solomon,[30] Joseph Barrell,[31] John Chaloner,[32] Isaac Franks,[33] and others who had business contacts in Europe with

whom they could arrange collections in Paris and remittances back to the United States if necessary. The brokers made it their business to become familiar with other businessmen who needed funds in Europe to pay for imported goods. This made them more competitive buyers of CLOBOEs, and they could narrow the percentage discount needed to sell the bills in the United States (or fatten their profit margins). As either principal or agent they offered to purchase the CLOBOEs in the United States at an adequate discount to compensate them for their service. Sellers were paid in cash or other mutually agreeable terms on endorsement of their CLOBOEs and transfer of the first through fourth bills. A few well connected brokers had always specialized in brokering "exchange" both here and in Europe to facilitate transatlantic remittances mostly for foreign trade. More active merchants had less need for brokers, since they employed their own agents in foreign ports to negotiate their money needs there.

The first regular American securities markets then developed at the local coffeehouses in major Atlantic port cities around the secondary trading of the CLOBOEs. Discounts ranged from 1 to 2 percent to over 35 percent depending on supply and demand and other market conditions. The brokers who handled the transactions simply added this line of business to their existing commercial activities. Haym Solomon[34] was the first to specialize primarily in the securities business. In practice once the bill was received and accepted by the commissioner in Paris, he notified Ferdinand Grand, United States banker in Paris, who held the initial funds supplied by the king through the agency of the Farmers General. The CLOBOEs were explicitly thirty-day sight drafts on their face, so Grand had up to thirty days to pay the proceeds. Robert Morris, superintendent of finance of the United States, wrote Grand on January 13, 1783, that a total of 8,431,750 livres worth of CLOBOEs had been sent to him for payment.[35]

Few potential investors knew about or understood the value of the special September 9, 1777, to March 1, 1778, CLOC sales promotion. Securities payable in cash through the transatlantic route proved too complex a scheme to attract needed investment. But the creation of CLOBOEs and their subsequent trading helped jumpstart the American capital markets. The sales promotion was a dismal failure when only $3,330,731 of CLOCs were sold in the six-month promotion period. And since almost all purchases were made with continental currency, which was worth between 75 and 20 cents[36] on the dollar at the beginning and end of the period, respectively, the specie value of those purchases might have been as low as $832,000. A sagacious investor might have then purchased 6 percent CLOCs with continental currency at face value but costing only 20 cents on the dollar. This strategy would provide the investor with a 30 percent current yield at the expense of this loan sale promotion—hardly a sound financial strategy for Congress.[37] CLOCs dated before March 1, 1778, became the premier security in the early American capital markets, and sophisticated investors sought them out, often without luck—as many investors held onto them, realizing their relative value because of the promised cash payment feature.[38] CLOCs issued before March 2, 1778, continued to pay interest in French cash, as promised, until September 9, 1782 (see p. 287–88).

More Congressional Financial Folly: Six-Months Bills of Exchange on John Jay in Madrid and Henry Laurens in Amsterdam

The initial reports of the Franklin/Deane/Beaumarchais success in raising French monetary assistance to pay the interest on American war debt prompted Congress to send additional emissaries to other European countries to raise additional funds. Ultimately, two

former Continental Congress presidents were sent as commissioners to countries that appeared to be the best prospects: John Jay to Spain on September 27, 1779, and Henry Laurens to Holland in October 1779. Congress also appointed Ralph Izard commissioner to Tuscany and William Lee to Vienna and Berlin, but no official American drafts were ever drawn on either of them. The productive channel of payment created by the CLOBOEs proved irresistible to Congress, which attempted to expand it when all other sources of funding dried up.

At first Jay's mission to Spain seemed likely to be productive. Commissioner Arthur Lee reported he had received assurances of Spain's willingness to provide aid for the American cause, though it was to be carried out under a cloak of secrecy so as not to incur the ill will of the British toward Spain.[39] Contrary to his expectations, after John Jay arrived in Madrid in April 1780 the new "minister plenipotentiary of the United States to the court of Madrid" found himself ignored by Spanish officials. After many tedious months Jay eventually received a promise of a guarantee for a $150,000 loan for the United States. He subsequently accepted nearly $35,000 worth of bills of exchange (see opposite) drawn on him; then he was told that Spain could no longer supply the $35,000 needed immediately. Jay was forced to take the accepted bills to Franklin in Paris and beg for his help in meeting them. Fortunately for U.S. credit standing abroad, Franklin had managed his position as minister plenipotentiary of the United States to the court of Versailles with enough skill that he was able to cajole his banker there, Ferdinand Grand, and French ministers into providing additional funds and thus avoiding a default. From Robert Morris's 1785 and 1790 reports of his 1781 to 1784 administration we learn that Jay ultimately was able to secure a total of $174,017 worth of loans from Spain.[40] Yet $386,894 worth of bills were presented to Jay. The overage had to be paid by Benjamin Franklin or the bills would be protested and the United States would be in default. This was hardly a sum worth risking American credit. Jay's attitude toward the bills is telling: "The bills drawn on me was considered a desperate measure, prompted by our Imbecility, and was a bad card to play at a time we were endeavoring to form a Treaty, and when Prudence demanded that the importance of Spain to us should not have been brought forward, or placed in such a glaring point of view."[41]

Henry Laurens's experience was even worse than Jay's. Ten months after Congress appointed him commissioner to Holland with authority to seek loans and military aid, Laurens was still lingering in the United States. On his August 13, 1780, transatlantic crossing the British captured his ship, and Laurens was charged as a traitor and imprisoned in the Tower of London. The British discovered loan documents in his trunk for a proposed 10 million florin Dutch loan to the Americans. This discovery might well have triggered the British declaration of war against the Dutch.

Congress had become destitute by the time of these foreign missions. Continental currency dropped in value to less than 3 cents on the original dollar by November 1779. Congress stopped additional continental currency issues in January 1779, but the currency continued to fall in value in a "no confidence" vote by the marketplace in Congress's financial policies. Under pressure to supply Washington's army, Congress then voted to order 100,000 pounds sterling worth of six-months sight bills of exchange drafted on each of Laurens and Jay on November 23, 1779. Jay was midocean on his way to Spain drifting in the dismasted and disabled ship *Confederacy* by that time, and Laurens was still in Charlestown, South Carolina. Congress reasoned it could use these bills as loan collateral for a bank of army supplies then being raised by subscription by Robert Morris, Thomas Paine, and others or under special circumstances with merchants who would for-

225 Mexican dollar U.S. bill of exchange #201, drawn on nonexistent funds of John Jay in Spain. This colorful Bill of Exchange was ordered by Congress November 23, 1779, and not used until July 5, 1780, when

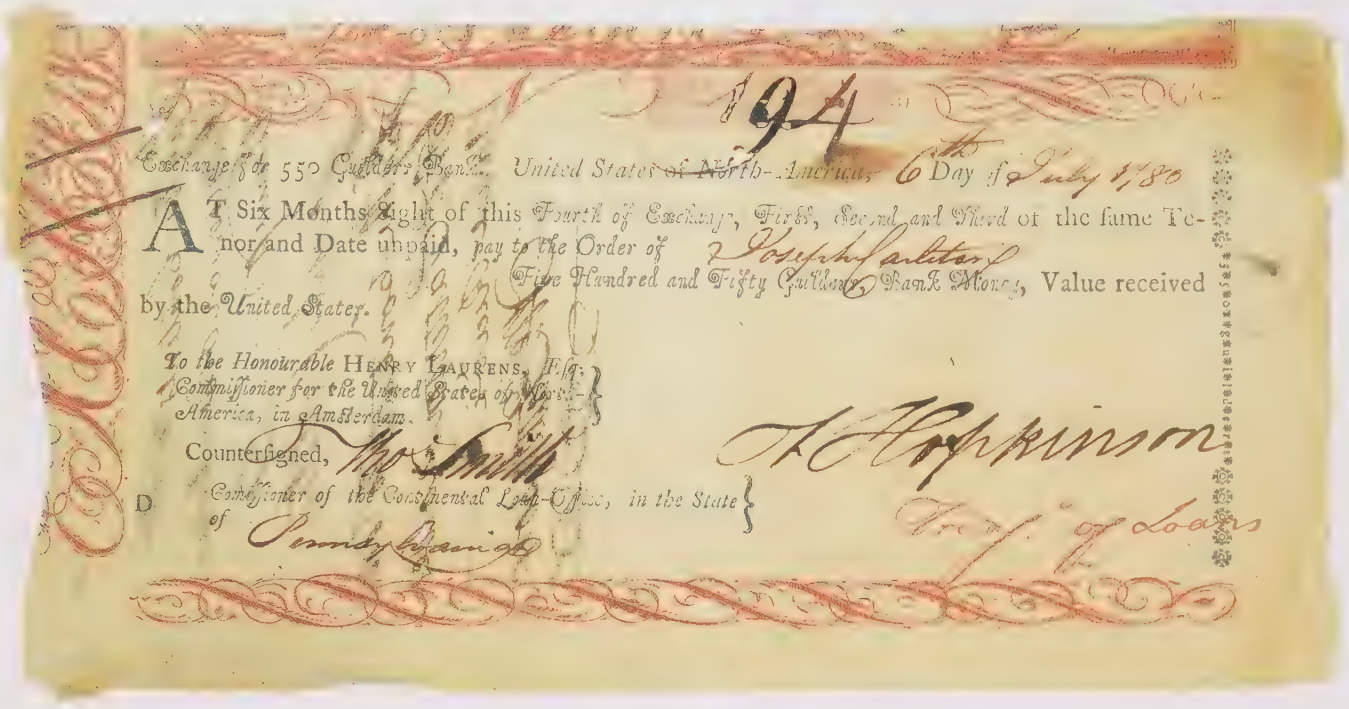
> the Board of Treasury beg leave to Report, That in pursuance of a Resolution of Congress of the 23d day of November last the sum of one hundred thousand and twenty five pounds eleven shillings sterling in Bills of Exchange at six months sight on the Hon'ble John Jay Esquire Minister Plenipotentiary at the Court of Madrid have been prepared under the directions of this Board. That all the said Bills have been sold, or reserved for the use of American Prisoners, or deposited in the Pennsylvania Bank, except about ten thousand pounds sterling.

Thomas Perkins, to whom this bill is made, is most likely Thomas Handasyd Perkins, a young clerk in the merchant counting house of the prominent Shattuck family in Boston. Perkins became a leading China trader, philanthropist, and Federalist Party leader. this bill was probably purchased at a discount by Perkins, acting as principal for the Shattucks, from Massachusetts commissioner of the Continental Loan Office Nathaniel Appleton, who also signs the bill. Proceeds of the sale likely were used to pay for clothing for Washington's army. Perkins used the bill to attempt to pay for goods purchased either in Europe or in the United States from a merchant willing to accept a six-month bill of exchange on Minister John Jay as payment.

Notice the symbolic top border of the bill: on the left are a plow, pick, rake, and shovel—the implements of the hard-working "AMERICA" that is scrolled in the center. At far right is a merchant ship carrying American goods to Europe to trade for war supplies, the purpose for which these bills were created. The motif was designed by Francis Hopkinson, who also signed it. The bills are printed on rag paper, and this one is watermarked "UNITED STATES 4."

When bills like this one were presented to John Jay in Spain he had no funds to discharge them. On July 5, 1780, when it was drafted on Jay, he hadn't even gotten to Madrid, and preliminary loan discussions with Spanish Minister Floridablanca had just been suspended.

bear presenting them until notified by Congress that the expected loans had been effected. Congress's reasoning ultimately proved incorrect. Imagine Laurens's surprise when some of these drafts (see page 282) on the proposed Holland loan were presented to him before he even left the United States for Holland. Jay was equally flustered when he began receiving the bills drawn on him before he reached Madrid. John Adams, ordered by Congress to replace Laurens on his mission in Holland after Laurens had been captured, had no choice but to send the bills, which he received drawn on Laurens, to Benjamin Franklin in France for payment to avert a reputation-losing American default. Franklin was incensed by the financial folly of Congress. He derisively termed Congress's habit of drawing on him for nonexistent funds "The Bank of Hope."[42]


194

Exchange for 550 Guilders Bank. United States of North-America, 6th Day of July 1780

AT Six Months Sight of this Fourth of Exchange, Firſt, Second and Third of the ſame Tenor and Date unpaid, pay to the Order of Joseph Carleton Five Hundred and Fifty Guilders Bank Money, Value received by the United States.

To the Honourable HENRY LAURENS, Eſq; Commiſſioner for the United States of North-America, in Amſterdam.

Counterſigned, Thos Smith

D Commiſſioner of the Continental Loan-Office, in the State of Pennsylvania

H Hopkinson

Treas. of Loans

Guilder "Bank Money" bill of exchange, drawn on Henry Larens from proceeds of a nonexistent Dutch loan. Not all of the six-months bills of exchange written on Henry Laurens and John Jay were used as collateral for the bank or supplies for Washington's army. This one is payable to Joseph Carleton, Paymaster of the Board of War. On July 1, 1780, the Board of War wrote to Congress,

> Some time since, Congress were pleased to authorize the Board to contract for cloathing for the army, to the extent of thirty thousand pounds sterling. The Board had it in contemplation at that time to furnish the army from a different quarter than had been usually practised; The event however has shewn, that the, plan is not now to be depended on, and it has in fact succeeded but in a small degree. As it appears from the Extracts of his Exc. General Washington's letters referred to the Board, that the troops are in the greatest distress, for the want of shirts and line overalls in particular, the Board request that Congress would authorize them to lay out twenty thousand pounds sterling of the above mentioned sum, in the immediate purchase of those necessary articles wherever they can be procured. They therefore report:
>
> Resolved, That the paymaster of the Board of War and Ordnance be furnished with bills on Europe to the amount of twenty thousand pounds sterling, to be applied by the said Board towards supplying the army with cloathing.

Then on July 5:

> Ordered, That on the application of the Board of War, a warrant issue on the treasurer, in favour of Joseph Carleton, pay master to the said Board, for the sum of fifty thousand dollars for the purpose of paying certain artificers; and for which he is to be accountable. [Further,] The Board of Treasury beg leave to Report, That in pursuance of a Resolution of Congress of the 23rd day of November last the sum of one hundred thousand and twenty five pounds eleven shillings sterling in Bills of Exchange at six months sight on the Hon'ble John Jay Esquire Minister Plenipotentiary at the Court of Madrid have been prepared under the directions of this Board. That all the said Bills have been sold, or reserved for the use of American Prisoners, or deposited in the Pennsylvania Bank, except about ten thousand pounds sterling; also that in pursuance of the aforesaid Resolution the sum of one hundred thousand one hundred and thirty six pounds five shillings and nine pence sterling in Bills of Exchange at six months sight on the Hon'ble Henry Laurens Esquire, Commissioner of the United States of America in Amsterdam, have been prepared in like manner,—the whole of which, has been disposed of, or deposited in the Pennsylvania Bank, from which Representation, Congress are determined to make further draughts, they may be enabled to judge of the propriety of giving immediate directions. (From *Papers of Continental Congress*, vol. XVII, pp. 582–92.)

Congress's desperation for money prompted this ill-advised issue even though they were well aware that on July 6, when the illustrated bill was written, that Henry Laurens was still in South Carolina, yet to depart for Holland—therefore there were no funds available in Holland to pay the bills to Paymaster Joseph Carleton or his order.

"Bank Money" of Amsterdam and Its Connection to the Origin of the New York Stock Exchange

It is significant to note from the face of the six-months sight bills on Henry Laurens that the funds promised were payable in "Bank Money" of Amsterdam in Dutch guilders. The other official bills on foreign envoys were either payable in "Mexican dollars" (silver dollars) or the holder was given a choice of Mexican dollars or French livres at the 1 for 5 exchange rate earlier suggested by the commissioners. The Dutch "bank money" influenced the development of the American capital market in a previously unrecognized and significant way. In this most important instance, the Dutch influenced Alexander Hamilton's bold new financial strategies—rather than the English model most often attributed to Hamilton.

The Dutch developed a powerhouse economy and world trading eminence around their unique Bank of Amsterdam (*Amsterdamsche Wisselbank*), founded January 31, 1609. Early Amsterdam city financiers organized it as a bank of deposit and exchange that was so efficient and well thought of that its bank money credits became worth more than specie. This advantage drew traders from around the world to trade in the Amsterdam market. Bills of exchange drafted on third parties were outlawed from use in Amsterdam except as deposits in the Wisselbank. Traders could spend and receive bank money of Amsterdam deposit-credits to purchase from or sell goods to other traders without worrying about the problems of coin clipping, counterfeiting, sweating, or other unscrupulous practices that were used to prey upon unsuspecting participants in other markets. Bank money credits were designed to be efficiently exchanged among depositors netted out on a daily settlement basis. The daily net settlement process dramatically reduced the amount of capital needed for the most active traders and merchants. The bank made a market (bullion exchange) in bank money (at first pegging bank money at a premium to specie) in addition to their daily exchange among depositors. After 1693 bank money deposit-credits could not be withdrawn (exchanged back into their bullion value) without replacing the bank money plus an 0.125 percent fee in the account and after paying a small renewal fee for the withdrawal privilege every six months. Because the bank engaged to keep all specie deposited and made no loans, traders became confident in the safety of their deposits. And the bank money remained at a premium after 1693, generally without support. Arguably, the broad usefulness of bank money helped the Dutch become the world's foremost traders during the seventeenth and eighteenth centuries.[43]

A similar and valuable role is played out today by the near daily net settlement or exchange process in the American capital markets of the Depositary Trust and Clearing Corporation (DTCC). In the twentieth century trading and confidence flourished on the NYSE as the exchange guaranteed the completion or settlement of every trade, regardless of the solvency of the member firms undertaking the trades. DTCC was created by NYSE members in the late 1960s paperwork logjam (analogous to the problems created in the early Amsterdam market by its myriad of hard to value counterfeit, clipped, or sweated coins of various countries). The DTCC estimates that its closed circle of members net trade settlement scheme saves its members 95 percent of the capital charges that it would require to settle trades individually.

The American roots of DTCC's capital enhancing function and its connection to the *Wisselbank* bank money can be traced back to Secretary of the Treasury Alexander Hamilton and his solution to the liquidity crisis caused by the first great stock market panic in spring 1792.[44] The roots of the panic of 1792 lay in the lack of an enforceable mechanism

to settle the financial obligations undertaken by auctioneers. Then, with the market and the economy all but gridlocked with panic, Hamilton wrote William Seton, cashier of the Bank of New York on March 22, 1792, with a suggestion that still-solvent brokers join together in a new liquidity-enhancing trading scheme guaranteed by the Bank of New York and the U.S. Treasury. (Part of the text of this letter is reproduced in the appendix. In it, Hamilton makes it clear that the Dutch mechanism for transferring credits within the bank should be adopted.)

The May 17, 1792, Buttonwood Agreement resulted.[45] The scheme, designed by Hamilton to mimic the *Wisselbank*, was to be headquartered at the Bank of New York and used deposits of Hamilton's newly created Stock in the Public Funds of the United States[46] to create bank deposit-credits (with terms similar to the Bank of Amsterdam's bank money), which were transferable without penalty only within a closed circle of market participants—ultimately, those signing the Buttonwood Agreement. Significantly, Hamilton offered the Bank of New York a guarantee against loss on $500,000 of the $1 million 7 percent loan facility to ensure its participation. Although the $1 million loan facility proved temporarily to be too small to stem the panic, Hamilton's Buttonwood Agreement–based securities trading scheme and the elimination of the badly flawed auctioneer-based security trading system restored confidence in the American capital market. The market began to function again after more than a month of near gridlock conditions.[47]

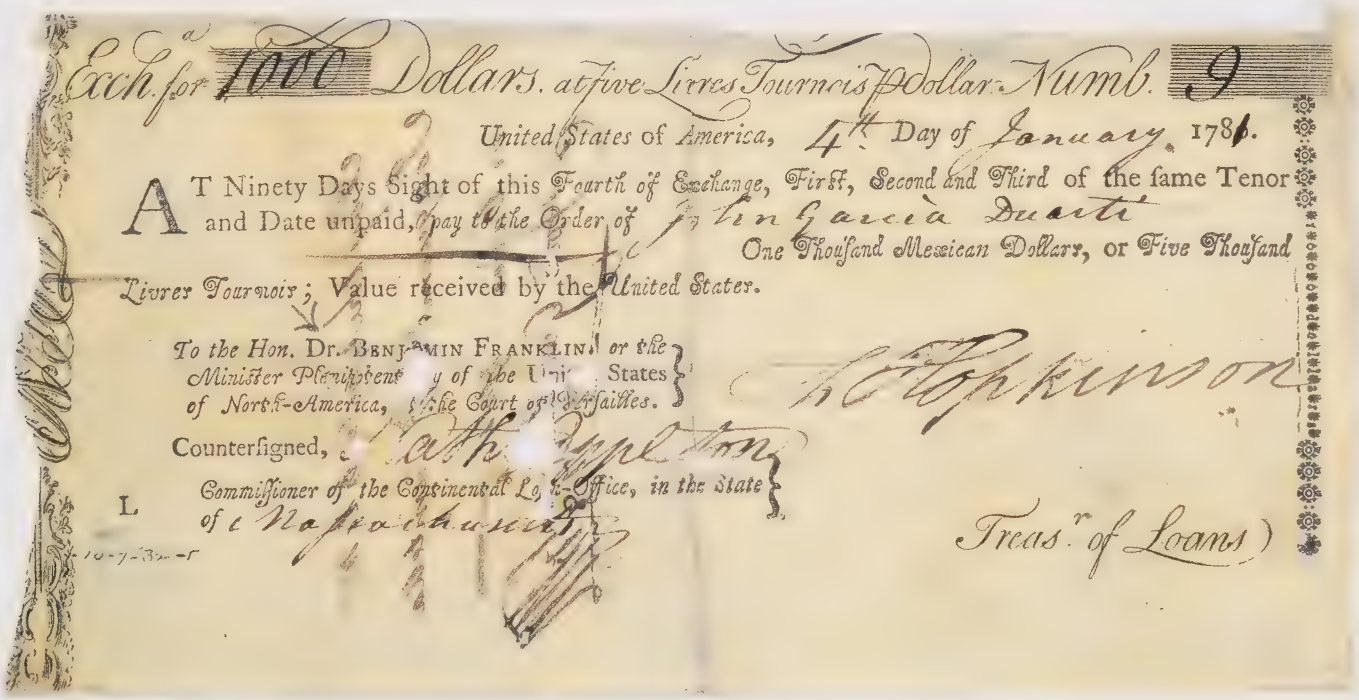
The Buttonwood Agreement signers, by virtue of their agreement became the first organized American securities exchange of cooperating brokers. Trading in the recovering 1792 market was led by the Buttonwood Agreement signers, a group that grew into the New York Stock and Exchange Board in 1817, the sales side of which is now called the New York Stock Exchange and the trade settlement and custody side, the Depositary Trust and Clearing Corporation. The DTCC daily settles an average of $1.7 trillion worth of transactions and provides custody of over $23 trillion worth of securities.[48] Confidence in DTCC's ability to settle transactions in an orderly manner has been severely tested recently by the Long Term Capital Management and the September 11, 2001, terrorist attack market debacles. Students of financial history with knowledge of the first stock market panic in 1792 may be concerned about potential future U.S. market problems created by foreign entities, beyond the jurisdiction of U.S. laws, who reportedly have been courted to become part of the closed circle of domestic DTCC clearing members.

Ninety-Day Bills of Exchange on Benjamin Franklin at the Court of Versaille, Ninety- and Sixty-Day Bills on John Jay at Madrid, and Six-Months Bills on John Adams at Amsterdam

By the summer of 1780 the Revolutionary War battlefront moved to the south. Charlestown fell to a British siege in May, and the war was going badly for the American army. There were desperate pleas for funds. Under pressure Congress authorized $100,000 of ninety-day sight drafts printed to draw on Benjamin Franklin at Versailles and $50,000 of sixty-day bills on John Jay in Madrid and ordered them sold in the southern states to provide a "military chest in the Southern department."[49] The bills on Franklin were addressed to him in his new position as sole commissioner, now titled on the face of the bill "Minister Plenipotentiary of the United States to the Court at Versailles." At least one sixty-day bill of exchange written on John Jay at Madrid survives. It is in the modest collection of Revolutionary War fiscal paper at the Smithsonian.

On January 3, 1781, Congress authorized drawing six-months sight bills of exchange on Minister Plenipotentiary John Adams at Amsterdam to pay for a clothing contract.[50] Previously, Adams had to forward all the bills on Henry Laurens and himself to Benjamin Franklin for payment. Adams was able to satisfy the first bills that arrived with cash from sales of Congress's tobacco and produce shipments as well as the loan-raising success of the Dutch banking consortium of Wilhelm & Jan Willink, N. & J. van Staphorst, and De la Lande & Fynje. This consortium was paid 4.5 percent to raise up to 5 million guilders at 5 percent for five years, and then the loan was repayable 20 percent per each subsequent year. Willink and van Staphorst remained U.S. bankers in Holland for the next forty years, but soon Congress and Superintendent of Finance Robert Morris overdrew this source by 1.3 million guilders and American credit suffered when the bills were protested.[51] John Adams railed against the overly optimistic projections of his Dutch investment bankers' loan-raising ability in a July 28, 1783, letter to Secretary of State Robert Livingston: "Believe me, this is all stock-jobbing gasconade. I have made very particular inquiries, and find the foregoing account to be the truth. Of all sons of men, I believe the stock-jobbers are the greatest liars."[52] Bills of exchange on John Adams in Amsterdam are known only in the collection of the Massachusetts Historical Society.

$1000 Continental Loan Office ninety-day sight bill of exchange to John Garcia Duarte, Benjamin Franklin at the Court of Versaille. This bill was part of a 1781 U.S. settlement with Captain John Garcia Duarte for $18,000. Duarte represented the owners of a Portuguese vessel illegally seized in 1777 by the American privateer Phoenix, in which Robert Morris held a one-twenty-fourth interest. This seizure became a major embarrassment to Morris and created an international incident that complicated American efforts to gain Portugal as an ally. Morris's private business activities reduced his effectiveness as United States superintendent of finance.


Exch. for 1000 Dollars. at five Livres Tournois ℘ Dollar. Numb. 9

United States of America, 4th Day of January 1781.

AT Ninety Days Sight of this Fourth of Exchange, First, Second and Third of the same Tenor and Date unpaid, pay to the Order of John Garcia Duarte One Thousand Mexican Dollars, or Five Thousand Livres Tournois; Value received by the United States.

To the Hon. Dr. BENJAMIN FRANKLIN, or the Minister Plenipotentiary of the United States of North-America, at the Court of Versailles.

Counterſigned, Nath Appleton

Commiſſioner of the Continental Loan-Office, in the State of Massachusetts

L

Treas.r of Loans

Robert Morris: Financier of the Revolution, Conflict of Interest, Default, and America's First IPO

Robert Morris, a long-time congressional insider and perhaps the most important American businessman of the Revolutionary period, was elected superintendent of finance in February 1781 and granted executive powers to effect a turnaround in continental finances. His agreement with Congress allowed him to pursue his private business affairs while he was superintendent. In fact, he also held conflicting official positions in the Pennsylvania Assembly and as agent for the State of Pennsylvania. During his administration, Morris used the nation's finances as a political tool and sometimes even gambled with its credit. Interpreting Morris's career through the transatlantic paper he used casts Morris in an unfavorable light, perhaps to a fault. Morris's help in financing Washington's war-winning August to October 1781 march on Yorktown and the subsequent defeat of Cornwallis's British army, however, qualifies him as a founding father. This successful march and its fortuitous coincidence with the arrival of the French fleet propelled the American victory that effectively ended the Revolutionary War.

During and after his term as financier Morris created and used several bills of exchange designed to access funds in Europe. His post-administration tobacco notes are perhaps his most creative. Soon after taking office, Morris petitioned Congress to take possession of all remaining bills of exchange printed on the foreign ministers and to allow him to solicit the collateralized lenders in his earlier effort to raise a bank of supplies for Washington's army in the summer of 1780. Morris proposed to those lenders that they exchange the collateral, which they received in return for their loans, for shares in his new scheme, the Bank of North America—America's first publicly offered stockholder-owned company. Trading the collateral bills of exchange on Jay and Laurens in return for Bank of North America shares on its initial public offer, which would occur some six months later on December 31, 1781, was implicit in his scheme.[53] He could then trade or sell the bills for cash—which he could use immediately for more pressing purposes other than the bank. Part of the terms of Morris's employment as superintendent specifically relieved Morris from any responsibility of providing for debts incurred by the United States prior to his administration. He hoped he could sell the bills so that it would take a long time for them to be presented for repayment. He speculated with continental credit that funds sufficient to pay them would be on hand. He took no actions to make sure such funds were there before negotiating for Laurens (861,050 guilders) and Jay ($94,050) collateral bills whose possessors agreed to Morris's proposal. Nearly all of the early $70,000 worth of initial subscribers to the Bank of North America public offering came from the owners of these bills. Unfortunately, when they were presented for payment in Europe, they caused commissioners there major embarrassment.[54] They did, however, jumpstart the initial public offering of the Bank of North America—which marked the beginning of the American stock market.

Morris was besieged every day for money which he did not have. His 1781–1784 superintendent of finance diary, annotated in *The Papers of Robert Morris 1781–1784* is filled with these daily demands. It can be rationalized that Morris was forced by the events of war to undertake the financially debilitating measures that he used. But Morris's letter to Benjamin Franklin on July 21, 1781, exposes Morris's weakness. He solicits Franklin to join him in financing a manipulation of security prices financed by a convoluted international check kiting scheme (bills of exchange at long sight used in place of checks) in order to earn money for the benefit of the United States. At this time Morris was both

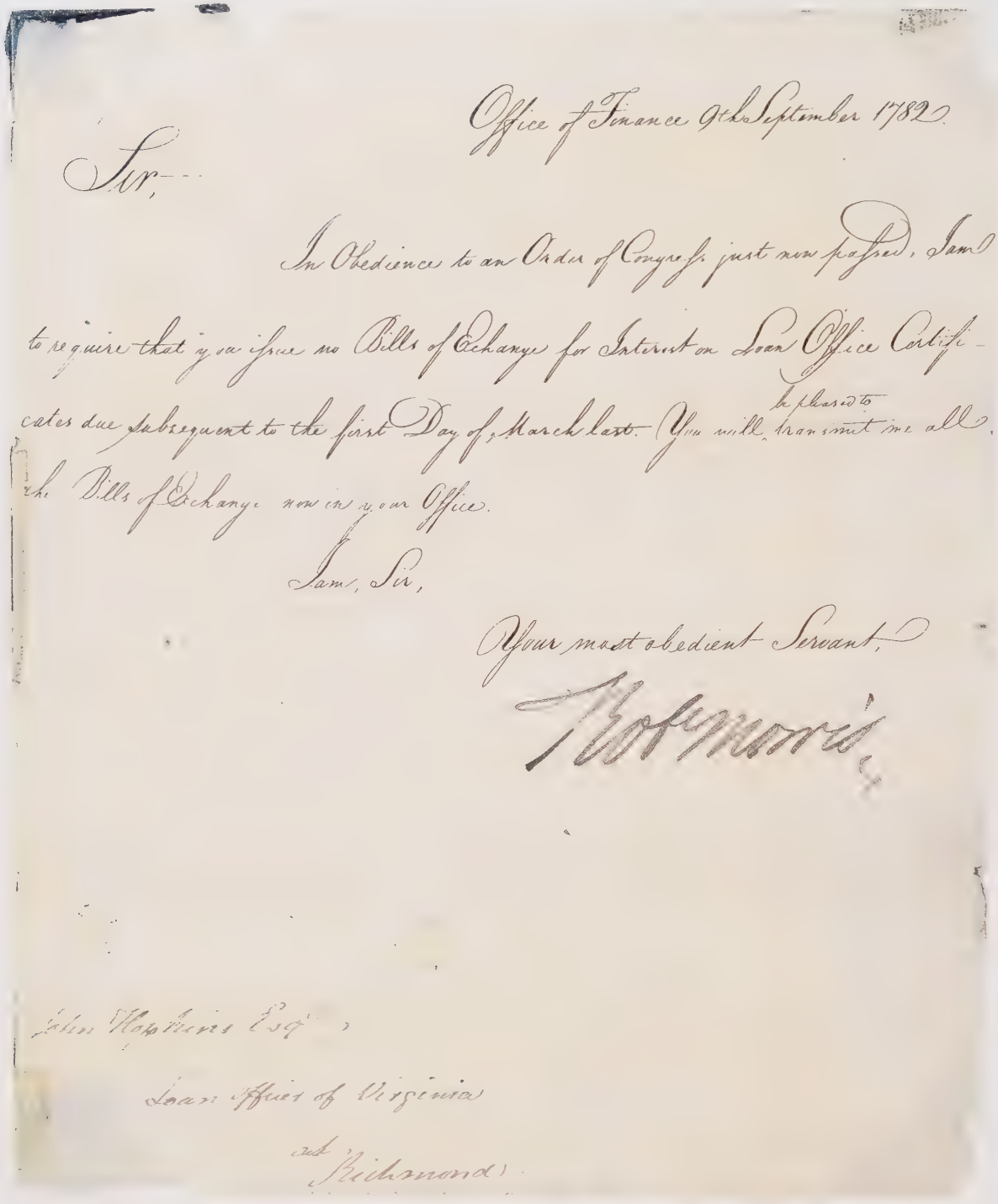
agent for the State of Pennsylvania and superintendent of finance of the United States. One can only imagine Franklin's reaction to this letter, which he never answered.[55] I suggest that Morris risked sullying the credit of the United States abroad through this proposal (which he later disavowed, but he suggested an even more elaborate bill kiting scheme later to Franklin). Morris believed that his position as financier allowed him to manipulate markets to earn funds for the United States. His 1790 report on the finances of his administration shows how meager were the results of these operations and proves their unworthiness in risking the credit reputation of the United States. His actions, in consistently overdrawing the accounts of the country's foreign ministers, undermined the faith of European financiers and their governments in Morris's ability to restore the credit of the United States. Morris's effectiveness in office declined rapidly after the October, 1781 Battle of Yorktown.

Robert Morris is also guilty of leading Congress to its first outright default of its financial obligations in a political maneuver to pressure the states to pay their federal tax requisitions. On September 9, 1782, Morris notified the Continental Loan Officers to suspend the CLOBOE transatlantic interest payments on the U.S. debt, even though he knew Louis XVI had granted the United States a new loan. Morris hoped CLOC security holders would bring pressure on the states to pay their federal tax requisitions so that he would have sufficient funds with which to make the scheduled interest payments. Morris's strategy backfired. Several states (Pennsylvania, Maryland, New Jersey, and New York) passed legislation to assume the burden of paying at least a paper interest on CLOCs held by citizens in their respective states. These acts forced Morris to pay a federal paper interest on CLOCs starting in 1784 just to maintain a federal jurisdiction over the Revolutionary War debt, a major goal of Morris's strategy.[56] Interestingly, the default allowed Morris to use his own bills of exchange to access the new French specie loans.

Morris also attempted to bypass the long-time U.S. banker in Paris, Ferdinand Grand, in favor of his own private banker, Le Couteulx and Company, with his future business.[57] Benjamin Franklin made sure that Grand was kept on since he was working on a 10 million livre French guaranteed Dutch loan for the United States. Morris had his own bills of exchange in French printed to draw individually on both Grand and Le Couteulx. He used these bills for both official business of the United States and his own personal business. Under the terms of Morris's employment as superintendent of finance he was allowed to continue in private business while he was in office. Morris separated the official versus private use of the French bankers' funds only by adding the appellation "S. I. of Finance" to his signature. Morris's protection of both his own and the United States' credit reputation abroad proved questionable at best as he repeatedly overdrew the funds granted in France, Spain, and Holland with both his own and his minister's customized bills of exchange.

Morris's aggressive overdrafts led to a rebuke from the normally reserved French Ambassador Luzerne. He wrote Morris about the problem on January 18, 1783:

> Be firmly persuaded. Sir, that these requests will be not only superfluous but they will merely demonstrate more and more the need of not deviating from the arrangements thus resolved and of not authorising by such an extraordinary acquiescence the usage too long practiced of drawing on the royal treasury without His Majesty's consent and then when the bills are negotiated of representing to us that it is to the credit and honor of the United States that we take it upon ourselves to pay them."[58]



Office of Finance 9th September 1782.

Sir,--

In Obedience to an Order of Congress just now passed, I am to require that you issue no Bills of Exchange for Interest on Loan Office Certificates due subsequent to the first Day of March last. You will be pleased to transmit me all the Bills of Exchange now in your Office.

I am, Sir,

Your most obedient Servant,

R Morris

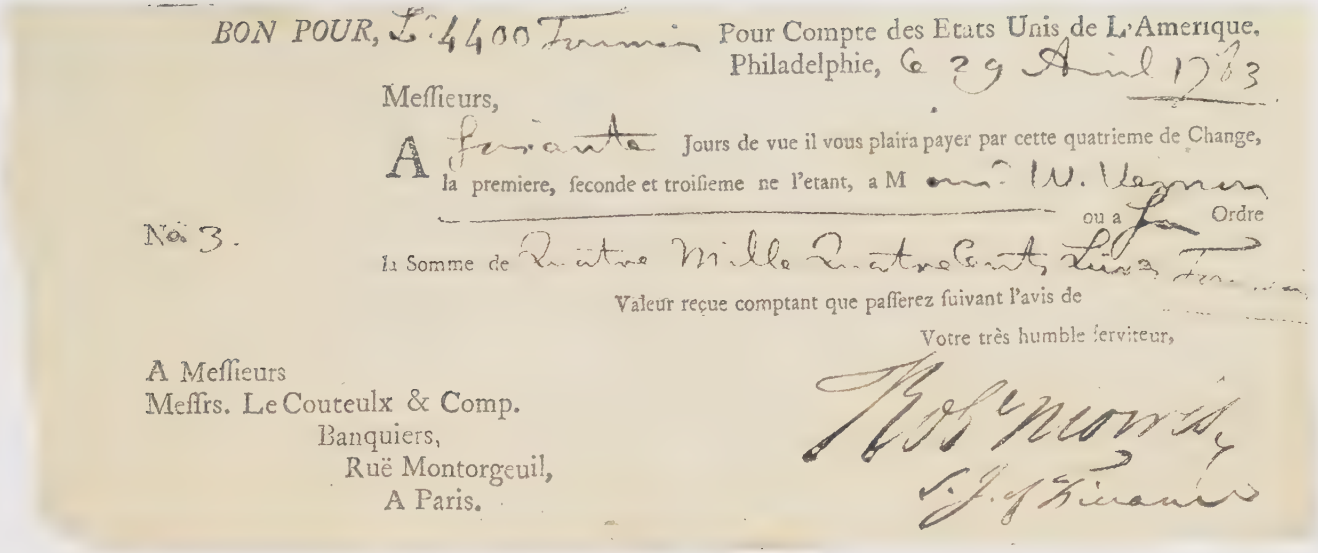
John Hopkins Esqr,

Loan Office of Virginia

at Richmond.

Above: *Robert Morris's September 9, 1782, letter to John Hopkins, continental loan officer of the state of Virginia, suspending the payment of CLOBOE transatlantic interest payments on United States debt obligations.* Morris also circulated similar letters to all the continental loan officers, triggering the first and only intentional U.S. default of its general obligations.

Opposite: Robert Morris public and personal bills on France. After Robert Morris overdrew his foreign minister's bank accounts he began to use his own customized bills of exchange in French to conduct both the public's and his own business. The bill at top is for 4400 livres and is signed by Morris as "S. I. of Finance" ("S. I." is Morris's contraction for "superintendent") and is supposed to represent a charge against the public account of the United States. The bill at the bottom is signed only "Robert Morris" and is supposed to be a charge against his personal account. Both bills, however, are drawn on Morris's accounts with Mssrs. LeCouteulx & Comp. Mixing public and private business was not illegal in 1783, but it must have put Morris's French bankers in an awkward position.



BON POUR, Lt 4400 Tournois Pour Compte des Etats Unis de L'Amerique.
Philadelphie, le 29 Avril 1783

Messieurs,

A Soixante Jours de vue il vous plaira payer par cette quatrieme de Change, la premiere, seconde et troisieme ne l'etant, a M ... W. Vernon ou a son Ordre

No. 3.

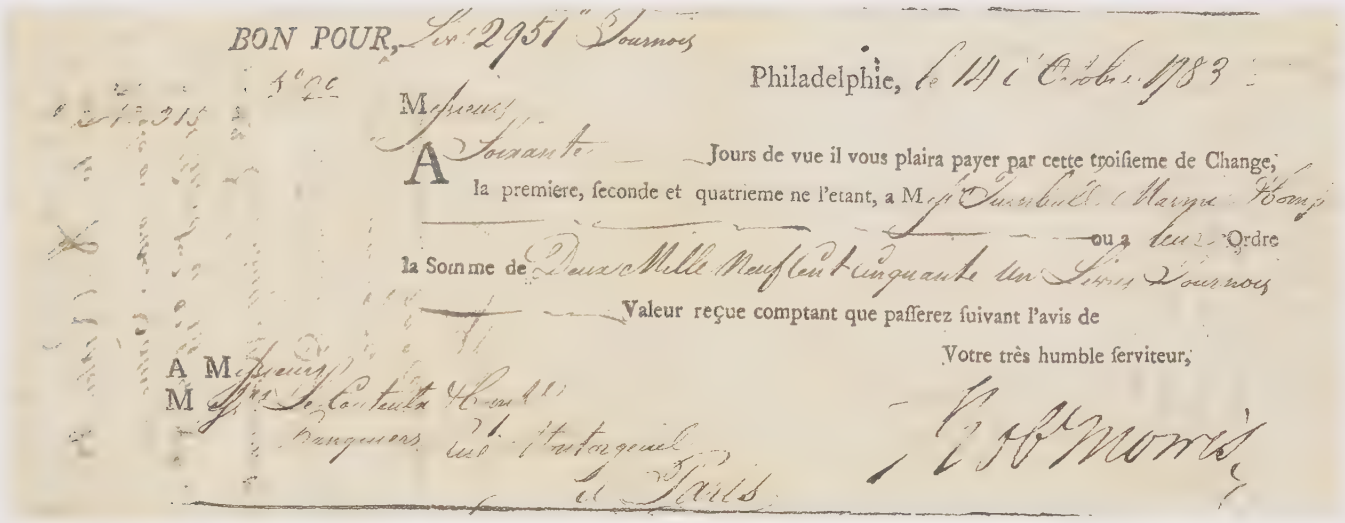
la Somme de Quatre Mille Quatre Cent Livres Tournois

Valeur reçue comptant que passerez suivant l'avis de

Votre très humble serviteur,

Robt Morris
S. J. of Finance

A Messieurs
Messrs. Le Couteulx & Comp.
Banquiers,
Ruë Montorgeuil,
A Paris.



BON POUR, Lt 2951 Tournois

Philadelphie, le 14 Octobre 1783

Messieurs

A Soixante Jours de vue il vous plaira payer par cette troisieme de Change, la premiere, seconde et quatrieme ne l'etant, a M ... Turnbull Marque Comp ou a leur Ordre

la Somme de Deux Mille Neuf Cent Cinquante Un Livres Tournois

Valeur reçue comptant que passerez suivant l'avis de

Votre très humble serviteur,

Robt Morris

A Messieurs
M ... Le Couteulx & Comp
Banquiers Rue Montorgeuil
A Paris

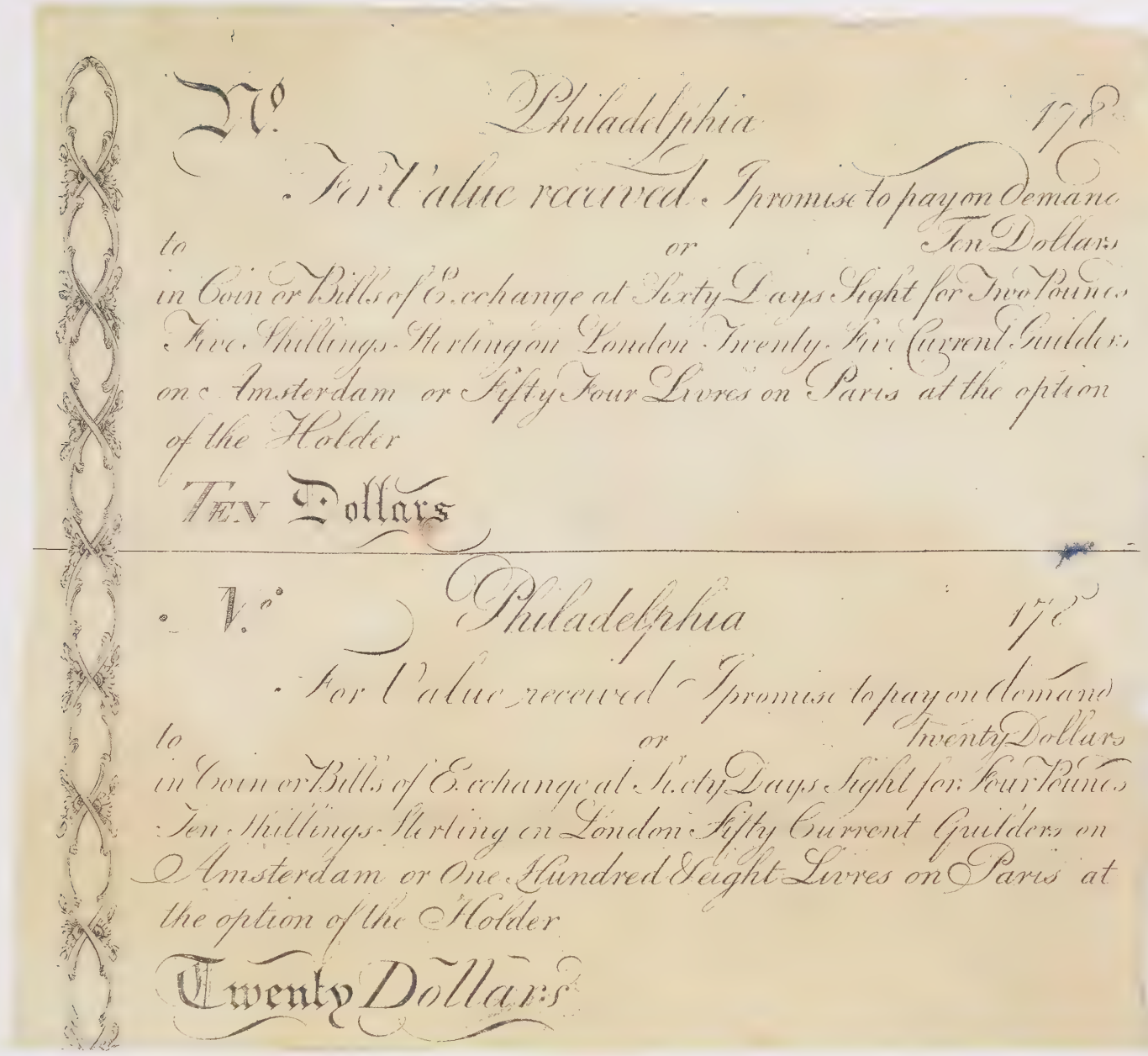
Before receiving this letter Morris already knew he had severely overdrawn Grand's account for more than 3.5 million livres. Six days later Morris announced his resignation as superintendent of finance to Congress. Alexander Hamilton later said Morris resigned out of necessity. His option was drawing for funds that he knew he could not fulfill. The resignation would also pressure the states to begin supplying the tax requisitions of Morris which the states mostly ignored. In any case, Morris did not follow through on his resignation threat but muddled through this crisis and remained in office until November 1784. Grand wrote Morris on July 20, 1783, that he had exhausted his personal credit by personally funding 413,892 livres of Morris's overdrafts.[59]

When Morris's European accounts were so overextended in the summer of 1783, he, Daniel Parker, John Holker, and several other intended partners were secretly outfitting the *Empress of China* for its historic first American commercial voyage to China. Parker claimed he had been reduced to poverty by the cost of the outfit, which ultimately totaled $119,000 specie split evenly between Robert Morris and Daniel Parker & Company, as the other intended partners had dropped out.[60] Morris, in his official capacity, also gave

the contract to supply the army in 1783 to Daniel Parker and William Duer,[61] and he advanced a substantial amount[62] in cash and specie worth of bills of exchange to Parker—ostensibly to more cost-effectively purchase supplies for the army. When Parker informed Duer that he intended to speculate on the exchange rate of the bills with those advanced U.S. funds, Duer tried to drop out of the contract.[63] George Washington complained about "bad and unwholesome provisions" to Parker and Duer in the summer of 1783.[64] In the summer of 1784, after the sailing of the *Empress of China*, Parker mysteriously departed from the United States.[65] He left a web of tangled affairs and a debt to the United States government for which he never accounted. Despite this, Parker reportedly lived in grand style at his French chateau and made a fortune trading depreciated American securities, primarily 6 percent final settlement certificates of the United States and the individual states, to Dutch bankers for resale in packaged trusts for the Dutch public.[66] As suggested in chapter 15, these packaged funds may have been among the world's first mutual funds, and Parker may have been the first American international investment banker.

Robert Morris created his most innovative tobacco note, convertible on demand into coin or transatlantic bills of exchange to any of the major cities of Europe, after he returned to private business exclusively in 1785. Throughout 1783 and 1784 Morris was enticed into the tobacco trading business by the prospects of personally gaining a monopoly buying contract from the world's biggest tobacco buyer, the Farmers General, the same French syndicate responsible for first supplying monetary aid to the American Revolutionary cause. In France Benjamin Franklin recommended Morris for the job.[67] By January 1785 Morris had a contract in hand to act as factor for the Farmers General in buying at least 60,000 hogsheads of tobacco over the next three years. Ironically, he had returned to the tobacco factor business of his father. Since the tobacco contract price was fixed at what were then below market prices, Morris had to wait until the market came down to his price in order to fill the contract. He employed trusted agents as buyers, and the difference in making or losing money often turned on how efficiently the purchase money could be transferred to the seller. Morris had well-known and creditworthy business partners and contacts in the principal ports and trading cities around the world.[68]

To become the most competitive buyer of tobacco in Virginia, North Carolina, and Maryland Morris developed his ubiquitous tobacco notes ($10, $20, $40, $100 and perhaps several other denominations) that he presigned and delivered to his buying agents to use as purchase money. For example, a $10 tobacco note promised on its face "to pay on demand Ten Dollars in Coin or Bills of Exchange at Sixty Days Sight for Two Pounds Five Shillings Sterling on London Twenty Five Current Guilders on Amsterdam or Fifty Four Livres on Paris at the option of the Holder." The notes themselves were printed on gray rag paper and were watermarked with the word "COMMERCE." The watermarked rag paper was likely made by Nathan Sellers and Mark Wilcox and printed by Hall and Sellers. The Farmers General placed 1 million livres at the disposal of Morris at his Le Couteulx bankers' office in Paris to allow him to begin buying tobacco. When the price of tobacco had dropped sufficiently for Morris's agents to begin buying, Morris's private tobacco notes began to circulate widely in Virginia and Maryland—much to the resentment and jealousy of the many middlemen, both French and American, bypassed by Morris's monopoly contract. Morris's objective with the tobacco notes was to create an attractive enough foreign exchange market with them in order to eliminate the use of tobacco shipments as remittances to Europe, a common practice in the eighteenth century. This would increase the supply of tobacco in the United States and help drive down the price, increasing the profitability of his fixed price three-year tobacco contract, Morris reasoned. His


No Philadelphia 178
For Value received I promise to pay on Demand
to or Ten Dollars
in Coin or Bills of Exchange at Sixty Days Sight for Two Pounds
Five Shillings Sterling on London Twenty-Five Current Guilders
on Amsterdam or Fifty Four Livres on Paris at the option
of the Holder
TEN Dollars
No Philadelphia 178
For Value received I promise to pay on Demand
to or Twenty Dollars
in Coin or Bills of Exchange at Sixty Days Sight for Four Pounds
Ten Shillings Sterling on London Fifty Current Guilders on
Amsterdam or One Hundred & Eight Livres on Paris at
the option of the Holder
Twenty Dollars

$10 and $20 tobacco notes. Robert Morris used notes like these to monopolize the American tobacco export business starting in 1784. By maintaining an active foreign exchange market centered around his tobacco notes, Morris hoped to stop shipments to Europe of tobacco, used by some merchants in lieu of cash remittances. Morris or his agents would buy tobacco here in the United States and pay in tobacco notes that were payable in cash either here or at sixty days sight in London, Amsterdam, or Paris. One reason for Morris's downfall was that he believed he could both monopolize and manipulate markets successfully, a belief that has humbled many headstrong traders since. Morris's foray into the tobacco market turned into a disaster as sellers delivered their worst-quality tobacco against Morris's low-priced Farmers General contract. Morris suffered significant losses when French inspectors refused to take delivery in France of some of the low-quality goods that Morris shipped at his own risk. When his European correspondents were not paid for the disputed shipments, Morris's bills of exchange to them could not be paid and went to protest. It is possible that Morris used the tobacco notes to pay off his "Morris Notes," issued while he was superintendent of finance.

tobacco notes "passed at not less than a 5 percent advance" in January of 1786 showing the success of Morris's effort.[69]

Morris's transparent strategy to drive down the price of the country's biggest export at the time won him few friends. Early in 1786 the Virginia legislature passed a law outlawing circulation of private bank notes and the Maryland legislature was seriously taking up the same issue.[70] The bills of exchange into which the tobacco notes were convertible were preprinted on simple rag paper both in French and English, with blank spaces for dates, names and amounts to be filled in.

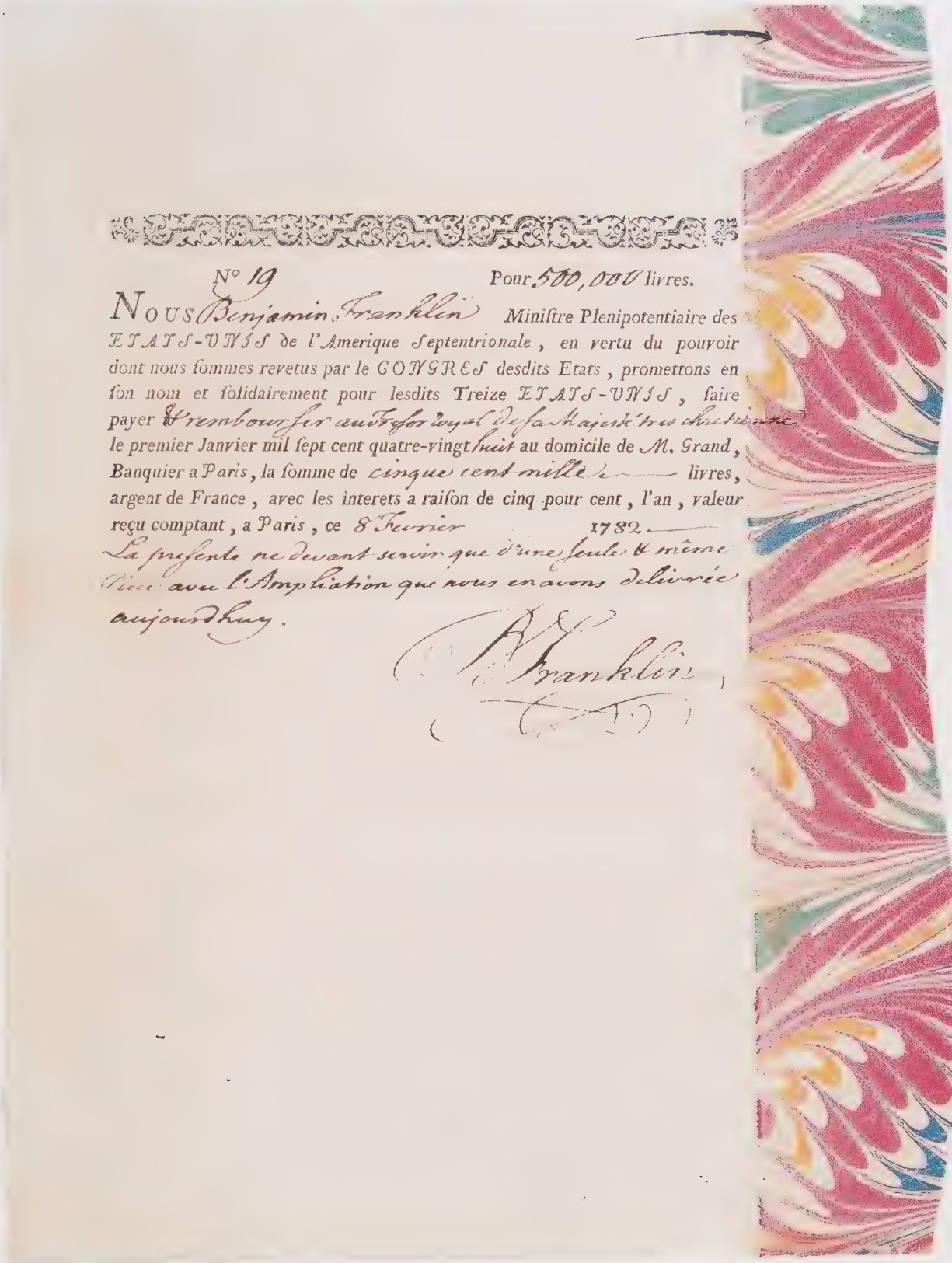
French Army and Marine Bills Default

When the French army under Rochambeau came to assist the United States in 1780 they brought substantial stores of silver and gold coin with which to supply themselves. By this time the American forces were reduced to supplying themselves by impressment[71] or contracts with private military contractors paid in paper. The French cash tended to draw in all supplies available. Suppliers did not want more paper for their supplies when they could get gold and silver from the French army. When the French cash ran low, leading American military contractors Wadsworth and Carter[72] agreed to supply the French troops and accepted French marine bills on the "Tresorier de la Guerre" for payment.[73] When these bills were presented in France, holders were informed that no funds were available and a one-year delay in payment had been ordered by the French treasurer. The French default caused Wadsworth and Carter to journey to France to straighten out their affairs there soon after the war was settled. Default worked in both directions in the early transatlantic paper trade.

Benjamin Franklin's Revolutionary Transatlantic Paper

While engaged as American minister to France, Benjamin Franklin found that he could make useful his skill as a printer, and he procured a press and printing tools for his home at Passy. Among his many activities there Franklin took up the cause of captured Americans in English prisons. He negotiated the exchange or release of hundreds of them. His practice was to supply the survivors with cash for the trip home, for which he had them sign three copies of a note acknowledging their promise to repay the French livres borrowed to the superintendent of finance of the United States. Another similar note was repayable in gold to the president of Congress of the United States.

Franklin's skill as a printer and his flair for the dramatic is perhaps best displayed in the obligations he printed that represented the consolidated American debt to France. On May 28, 1782, the American Congress authorized Benjamin Franklin to settle (liquidate) the American debt to France from the beginning of the war up to that time. Franklin wrote to Robert Morris on June 25, 1782, that the settled-upon debt was 18 million French livres to accrue interest at 5 percent and that the king had agreed to a repayment schedule starting in 1788, with twelve consecutive annual payments. The king forgave any interest due to date.[74] Franklin then printed twenty-one official receipts (in duplicate, one for the United States and one for France) for the individual sums (250,000 to 3 million livres) borrowed during each of the twenty-one former time periods in which the debt had been incurred. These securities, representing the American obligation to the French king, have a wide marbled strip down the middle that was scored to create the two matching parts of the contract. Ironically, Franklin procured this paper in England as it is very



N° 19 Pour 500,000 livres.

NOUS Benjamin Franklin Miniſtre Plenipotentiaire des ETATS-UNIS de l'Amerique Septentrionale, en vertu du pouvoir dont nous ſommes revetus par le CONGRES desdits Etats, promettons en ſon nom et ſolidairement pour lesdits Treize ETATS-UNIS, faire payer & rembourſer aux Tréſors Royal de ſa Majeſté très chrétienne le premier Janvier mil ſept cent quatre-vingt huit au domicile de M. Grand, Banquier a Paris, la ſomme de cinque cent mille ——— livres, argent de France, avec les interets a raiſon de cinq pour cent, l'an, valeur reçu comptant, a Paris, ce 8 Fevrier 1782.

La preſente ne devant ſervir que d'une ſeule & même Piece avec l'Ampliation que nous en avons delivrée aujourd'huy.

B. Franklin

American Revolutionary War debt to France, signed by Benjamin Franklin. The few extant French debt receipts, like this one for 500,000 livres, are the most colorful direct evidence of the American debt for the incalculably valuable French assistance in the Revolutionary War. The story of the opening of American diplomatic relations with our country's first foreign ally, France, can be artfully traced by the transatlantic financial instruments used to conduct business between the two countries.

similar to paper on which he printed personal obligations there in the 1760s and which he also used on his experimental $20 bills of the first issue of continental currency. This border treatment is rare in eighteenth-century ephemera, so it must have been very expensive and difficult to produce.

Franklin was thus able to immediately settle (liquidate) the American debt to France. This accomplishment stands in sharp contrast to Robert Morris's ability to settle his own accounts with the United States. No records exist of Morris settling his accounts with the United States prior to his service as superintendent of finance. A single entry debiting Robert Morris $93,312.63 on the books of the Treasury dated June 29, 1796, attests to the fact that some sort of settlement was reached—but details are lost, perhaps forever.

Establishment of National Credit: International Demand for American Securities as Prime Investments

The depressed state of U.S. credit from 1783 to 1789 was reflected by the 5 to 35 cent on the dollar price of 6 percent state and United States final settlement certificates (finals)[75] and 6 percent Continental Loan Office Certificates. Annual interest payments on the finals had to be legislated each year and most often were paid in paper indents.[76] Adventurers led by expatriate Daniel Parker in Europe and Dutch banker Pieter Stadnitski convinced other leading Dutch bankers to begin buying up these securities for placement in what became a series of twenty-six or more syndicated Dutch trusts. The undertakers, as the Dutch syndicators were then called, at first guaranteed the interest rate promised by the securities and then marked up the price of the 6 percent final settlement securities to as much as 50 or 60 cents on the dollar before pricing the trust *certificaats* for sale to the Dutch public, a very profitable business. The resulting transatlantic arbitrage scheme lifted the price of American securities and created an American ally out of the Dutch banking community.[77] These Dutch syndicates counted on future policies of the United States to make Revolutionary War liquidated debts whole. Hamilton's plan to restore the public credit proposed exchanging the liquidated war debt from questionable paper interest-bearing securities into three classes of the far more desirable 3 percent and 6 percent cash-paying "Stock in the Public Funds of the United States" (also known as United States Loan Office Certificates) backed by appropriate federal tax revenues.

In the February to March 1790 First Congress debates to pass Hamilton's plan to restore the public credit, a significant faction of Congress, led by James Madison, broke with Hamilton and suggested paying something to the original recipients (then called "discrimination") of the 6 percent state and United States final settlement certificates to the detriment of their present holders, who were mostly speculators, including the Dutch trusts. Most of the original holders, the soldiers and suppliers, had sold them to the speculators for personal reasons at the deep discounts demanded then by the marketplace. Madison's proposal had emotional appeal, but Hamilton countered that to limit retroactively the contract rights of the present security holders (whose securities were designed by Congress to be fully negotiable) would be unbusinesslike and unconstitutional and would forever do harm to the country's credit. Hamilton's good sense and persuasive arguments prevailed and the Madison forces were defeated 36 to 13 when the matter was quickly brought to a floor vote on February 22.[78]

Businessmen, financiers, and investors around the globe concluded that the United

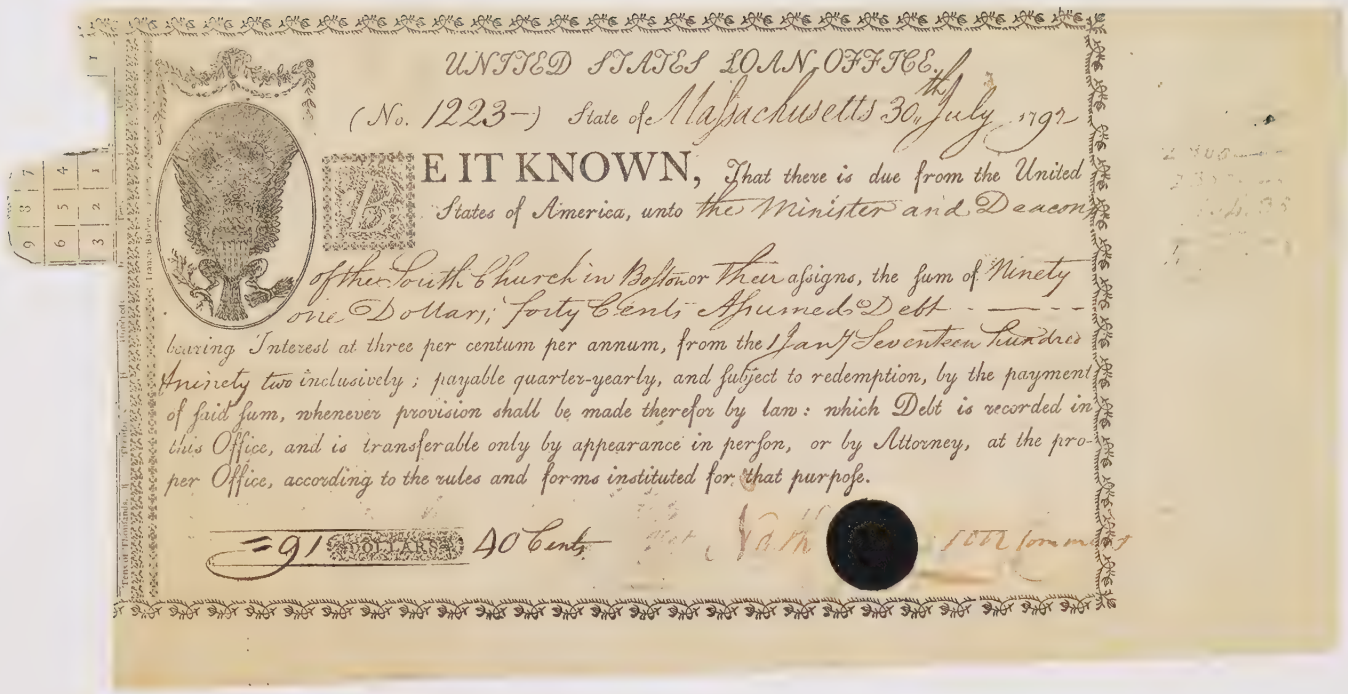
CERTIFICAET.

N.o 162. Den Houder dezer zal gerechtigd zyn tot een twee honderdſte aendeel in het overgeblevene Capitael van 130,000 Dollars *Liquidated Debt* ofte Vereffende Schulden, tot laſte der Vereenigde Staeten van America, geſteld ten naemen van Jonker CHARLES HENRY FRANÇOIS VAN DER BORCHT, Jonker JOSEPH HENRY DE BOSSCHAERT en den ondergeteekenden, ten wiens Comptoire ten Jaere 1790 daer op gedaen is eene Negociatie van *f* 200,000 wiſſel-gelt, doch zal dit recht eerſt gelden, NA DAT ALLE DE DAER OP UYTGEGEVENE OBLIGATIEN ider à *f* 1000 wiſſel-gelt zullen zyn uytgelot ofte gerembourſeert en dus alleen op dat ſurplus, 't welk zoo de *Liquidated Debt* intuſſchen mogt afgeloſt worden, zal overig zyn.

Antwerpen 30 Meert 1791.

1,000 guilder Dutch Certificaet number 162 of 200 issued. 1791. This certificaet represented a 1/200 interest in $130,000 face amount of United States "Liquidated Debt" securities, most likely 6 percent state or United States final settlement certificates.

Dutch financiers and their American counterparts from 1785 to 1792 scrambled to buy up the deeply discounted 6 percent finals, then made additional representations (guaranteeing interest payments at a certain level for ten to fifteen years), marked the price up significantly, and then sold Certificaet interests to the Dutch and Flemish public. These Dutch investment trust buyers first demonstrated the value and credibility of investing in United States securities.


UNITED STATES LOAN OFFICE.

(No. 1223–) State of Massachusetts 30 July 1792

BE IT KNOWN, That there is due from the United States of America, unto the Minister and Deacons of the South Church in Boston or their assigns, the sum of Ninety one Dollars, forty Cents, Assumed Debt ——— bearing Interest at three per centum per annum, from the 1st Jany Seventeen hundred & ninety two inclusively; payable quarter-yearly, and subject to redemption, by the payment of said sum, whenever provision shall be made therefor by law: which Debt is recorded in this Office, and is transferable only by appearance in person, or by Attorney, at the proper Office, according to the rules and forms instituted for that purpose.

=91 DOLLARS 40 Cents

$91.40 3 percent assumed debt stock in the public funds of the United States, owned by the Old South Church of Boston. This represents one of the three classes of 3 percent and 6 percent stock exchanged for up to $21.5 million worth of the Revolutionary War debt of the states under the terms of Hamilton's 1790 plan. The only difference between debt certificates issued for the assumed debt of the states and the funded debt of the United States was the "assumed debt" sea between Nathaniel Appleton's signature and the denomination at the bottom of the certificate, and the words "assumed debt" handwritten in the body of the certificate. A total of $18,271,786.47 worth of assumed debt and $46,185,177.43 worth of funded debt was ultimately exchanged.

These were the securities issued in Hamilton's debt consolidation and repayment plan, which first established the United States as a reliable credit. Foreigners flocked to buy United States securities when the first Federal Congress honored her obligations. By June 30, 1803, foreigners were holding $29,548,611.88 worth of this old debt, as it was termed, or almost 49 percent of its outstanding balance.

States promised to be a place where security holders' interests would be protected in a businesslike way so that they could trust investments made there to be treated fairly by the new government. After this vote capital began to flow in earnest into the American securities markets from all over the world. Within a year and a half the 6 percent final settlement certificates, which traded as low as 5 to 10 cents on the dollar during and after the Morris administration, had soared to over 100 cents on the dollar in one of the greatest bull markets in American history. Even larger sums of money flowed into Hamilton's three new 3 percent and 6 percent classes of Stock in the Public Funds as confidence in his American financial policies grew. Dutch investment trusts were soon designed around investments in Hamilton's 3 percent and 6 percent stock. Soon investors clamored for new investment opportunities and the Dutch trusts invested in the new stock of the $10 million Bank of the United States.

Confidence established, the American capital markets were open and ready to serve the business of the new nation. Once U.S. securities earned the respect and confidence of foreign capitalists, the American economy began its 212-year growth phase, which continues today to be much influenced by international investment and transatlantic capital flows.

Postscript

From a financial standpoint, early American history is a rich field for discovery. Researching transatlantic paper used from 1775 to 1793 reveals much about the origins of the American capital markets. Revolutionary War transatlantic paper was first designed to accommodate the growing relationship with the U.S. allies in Europe, primarily France, but to a lesser extent Holland and Spain. Most of the financial instruments created were bills of exchange, but a few special pay orders for returning prisoners of war or receipts for the consolidated American debt to France were used. Unfortunately, rather than accommodating the relationship, the misuse and politicizing of the bills of exchange on our foreign ministers served to discredit the United States and to irritate its foreign bankers and their sources, the very governments and investors with which we sought to ally ourselves. The prolonged high cost of the war, the financial policies of Congress and Robert Morris, and the inability of the states to agree and act on a cogent overall confederation financial plan drove the price of American securities and the value of her credit to all time lows from 1779 to 1788. Despite the financial folly displayed by Congress and Robert Morris, as the U.S. financier of the Revolution, Morris managed to finance Washington's successful march to Yorktown, which cemented the American victory in the Revolutionary War.

Morris continued to abuse both his personal credit and that of the United States and her envoys after the war-ending Battle of Yorktown. He did, however, immediately begin a process of liquidating and settling Revolutionary War claims against the government by issuing new 6 percent final settlement certificates—a process that wasn't completed until the final settlement of the states with the United States on June 29, 1793. The extremely low prices at which these securities traded presented a major speculative opportunity for those who were willing to risk that some solution to the U.S. financial crisis would be found. These securities became more actively traded and were a favorite with speculators and investors as they became better known in Europe after being touted there by America's first international investment bankers. American credit was prostrate until the 1789 to 1791 First Federal Congress, armed with a new constitutional framework for government with more flexible powers, as well as the leadership and sound financial policies of Treasury secretary Alexander Hamilton, successfully implemented his plan to restore the public credit. Foreigners then flocked into the U.S. securities markets, buying up the freely negotiable American securities, the contracts to which the first Federal Congress had repledged itself to honor, regardless of who owned them. When the stock market panic of 1792 tested Hamilton's new financial system, Hamilton used his knowledge of the Dutch financial system to restore international confidence in the American markets. Thus, the American securities illustrated and discussed in this chapter came full circle from specially designed instruments to access loans granted to American envoys, to regular American issues that foreigners demanded because of their competitive investment appeal. The transformation of the United States from near bankrupt supplicant to confidence-inspiring prime credit reveals important precedents in the development of the American capital markets. International confidence created the investment demand and subsequent national liquidity that the United States' two earlier governments could not achieve because of their continually weak, unbusinesslike, and mostly uncoordinated attempts to finance the Revolutionary War.

Appendix

Relevant text of Treasury Secretary Alexander Hamilton's previously unpublished four-page March 22, 1792, ALS to William Seton, cashier of the Bank of New York. Hamilton's advice to Seton directly led to the signing of the May 17, 1792, Buttonwood Agreement and the beginning of the NYSE.

If your distress continues would not the following plan be advisable for your institution?

Let deposits of Stock be received to an amount not exceeding a million—Six per Cents at *par* three per Cents at 10 shillings on the pound and deferred at 12 shillings—Let credits be passed on your books in favor of the Depositors for the amounts, according to those values, transferable at the Bank as in the case of deposits in the Bank of Amsterdam—and if required receipts may be given to the parties. Let the terms of the deposit be that the Depositors may withdraw their Stock at any time paying in specie the sums credited whenever the Credits have been transferred—with a right to the Bank after six months to sell the Stock and pay them the overplus. Let the Bank engage at the end of six months to pay the amount of these Credits in Gold or Silver; for undertaking which let them receive a compensation in Interest at the rate of ? per Centum per annum.

I take it for granted in the prevailing disposition of your City, transfers of these Credits under the promise of the Bank to pay in Specie at the end of six months would operate as Cash in mutual payments between Individuals—while the Bank would be safe from the danger of a run and undoubtedly safe eventually.

To render the operation more perfectly safe to the Bank, I will engage at the expiration of six months to take off your hands at the rate specified to the amount of 500,000 Dollars—in case the parties should not redeem & there should be no adequate demand. Which however is not supposeable.

I have thought a good deal of this plan and I really believe it is a good one and will tend to obviate the necessity of ruinous sacrifice of the Public Stock by parties indebted—Such as it is however I give it to you. Perhaps a change in your affairs for the better may render it unnecessary.

17

Origins of the New York Stock Exchange

RICHARD SYLLA

The New York Stock Exchange, measured by the market capitalization of the securities listed and traded on it, is the world's largest organized securities market. At the end of 2001, the market cap of the NYSE was more than $12.5 trillion, of which $11.7 trillion consisted of 2,567 common stock issues. Including other stocks and warrants, the NYSE at that date listed nearly 3,000 issues of 2,800 companies.[1] In rough terms, the NYSE market cap at the start of the twenty-first century is four to five times larger than the next largest stock market, in London.

The preeminent position of the NYSE among world markets is the result mainly of its being the leading securities market of the United States. The United States is the world's largest national economy, a majority of the world's largest corporations are U.S.-based, and most of these large corporations list their shares on the NYSE. This has been the case since the latter half of the nineteenth century when large corporations became numerous in the United States, more so than anywhere else, and the United States surpassed the United Kingdom to become the largest industrial economy.

We live today in a new era of economic and financial globalization, in some ways like the earlier one that arose in the period from 1870 to 1914. Now, as then, securities are listed and traded in international markets. The NYSE is listing more and more securities of firms head-

quartered in other countries. Despite that, it is still primarily an American market. London and other markets are more international than the NYSE. That is the way it has been since the late eighteenth century, the period to which the stock exchanges of both London and New York trace their origins.

This essay addresses the origins of the world's preeminent stock exchange, the NYSE, including how it emerged as the central securities market of the United States, and what economic, business, and financial advantages the country gained from having such a central marketplace. The focus is on the country's experience in the area of New York's Wall Street during the first half-century after the new federal government seated itself in 1789 under the Constitution. That half-century is essentially coterminous with the NYSE's early history. The NYSE traces its origins to 1792, and within a few decades it became the central U.S. securities market. The United States and the NYSE, as it were, grew up together, to such an extent it can almost be said that the history of one cannot be understood without reference to that of the other.

New Amsterdam and New York

Most people are aware that for virtually its entire history the NYSE has specialized in the trading of common stock. Fewer know that the city where it is located owes its origins to the innovation of common stock. Financial historians contend that the Dutch East India Company issued the first tradable equity share in 1609.[2] That very year, the company commissioned an expedition led by Henry Hudson, an English explorer, who sailed into what eventually became known as New York harbor on September 3. Hudson explored the river that now bears his name and reported back to the company on the economic potential of the region. Hudson's information led the company to sponsor additional expeditions and establish a few settlements, including Fort Orange near the present-day Albany, but not one at the mouth of the Hudson. Credit for that goes to another company, the Dutch West India Company chartered in 1621, which also issued tradable equity shares. The company established a small settlement on present-day Governors Island in New York harbor in 1624. Some of these settlers moved the short distance to Manhattan Island in 1625, and in 1626 Peter Minuit, a company official, bought Manhattan from the local Indians for a variety of goods valued at 60 guilders, or $24.

In 1653, the Dutch built a defensive wall from the Hudson to the East River at the northern border of their Manhattan colony, which they had named New Amsterdam. The wagon road running along the wall would later be called Wall Street. The northern border of 350 years ago is now close to the southern tip of a fully settled, long and narrow Manhattan Island.

The English, who by 1664 had planted colonies to the north and south of New Amsterdam, considered control of New Amsterdam by the Dutch, their great rivals of that era, a potential threat to their North American colonies. In March 1664, English monarch Charles II granted the Dutch territory to his brother James, Duke of York (later King James II). In August, James sent a fleet of four warships and several hundred soldiers into the harbor to assert his claim to New Amsterdam. In early September, after considering armed resistance, the Dutch peacefully surrendered the colony to the English, who renamed it New York City. Treaties of 1667 and 1674, which ended the second and third Anglo-Dutch wars, formalized English control of New York. In 1688, the English in the Glorious Revolution deposed James II, replacing him with the Dutch leader Willem of Orange, the husband of James's daughter Mary. Willem of Orange became William III of England.

For potential as a future American and world financial center, New York City could not have been more fortunate in its dual national origins. Dutch power in the seventeenth century derived in great part from a financial revolution that occurred in the Dutch Republic at the beginning of that century. The innovation of tradable equity shares in 1609, mentioned above, was but one element of the Dutch financial revolution. Even earlier, the Dutch had established sound public finances and a public debt market, which the Republic used to finance its long war of independence from Spain, as well as the later wars with England. The year 1609 brought another innovation, the Bank of Amsterdam, or *Wisselbank*, a central banking institution that discounted foreign and domestic bills of exchange and did much to stabilize the value of the Dutch guilder. With a public debt market in place, it proved simple for the Dutch to add to it trading in the equity shares of the bank and the Dutch East and West India Companies. Other, lesser banks and insurance markets arose at the time to complete the Dutch financial revolution, transforming the small republic into a major world power. Shortly thereafter followed the Dutch golden age, "the embarrassment of riches," and, of course, the tulipmania.

In 1688, when Willem of Orange became William III of England, he brought Dutch financiers with a long heritage of financial expertise with him to his new country. The Glorious Revolution made England a constitutional monarchy and transferred the power of the purse from the king to Parliament. An English public debt market like that of the Dutch Republic soon emerged, as in 1694 did the Bank of England, which lent to the government and discounted merchants' bills of exchange. Each of these institutions proved as useful to the English in their wars with France and the United States as their Dutch counterparts had been to the Dutch Republic in its wars with Spain and England. The pound sterling, like the Dutch guilder earlier, became a more stable currency. Before 1688, the English already had a number of private bankers, some of goldsmith origins, most of them in London and its environs. Many more banks were founded during and after the English financial revolution, and banking began to spread to the English countryside, a development that gained momentum during the eighteenth century. Tradable equity shares in the Bank of England, the English East India Company, the South Sea Company, insurance companies, and other lesser enterprises completed England's financial revolution.[3] In its wake, Great Britain won most of its wars, built a great empire, launched the first industrial revolution, and, of course, had the South Sea bubble of 1720 and many other financial crises.

England's North American colonies were part of an expanding British empire. Although most of them had been founded before the Glorious Revolution and the financial revolution it unleashed, they were still quite small and unimportant parts of the empire at the start of the eighteenth century. But their populations were growing rapidly through natural increase, immigration from Europe, and the slave trade.

Colonial and Revolutionary Finance

A question that arises when considering America's colonial history is why nothing occurred there that resembled a modern financial system like those of the Dutch and English financial revolutions. A possible answer is that it was not needed. Almost all Americans were farmers of one sort or another, many of them self-sufficient with limited market orientations. The main financial need for the rapidly growing American population and its economy was an expanding medium of exchange. That need was met by a financial innovation, a distinctly American one: fiat paper money issued by colonial governments. Fiat paper money took the form of bills of credit, akin to tax anticipation

notes, and public loan-office issues that accommodated borrowers, usually on landed security, while furnishing an interest income for colonial governments. Fiat paper issues supplemented precious-metal coins of other countries that the colonies earned through trade. Colonial bills of credit and loan-office bills provided a convenient solution to the problem of finding an expandable medium of domestic exchange.

A more obvious answer to the question of why colonial America had no financial revolution is that colonial Americans, as British subjects, had the access they needed to Britain's modern financial system. They were part of the empire and connected to its financial networks. Short- and intermediate-term credit was the main financial demand of colonial merchants and planters, the small class of Americans dealing in the international economy. Trading partners of colonial American merchants and planters in Britain, who were more directly and immediately tied into the home country's financial networks, were more than willing to supply the credits the Americans needed.

What made the colonial merchant and American patriot Robert Morris so valuable to the United States after it declared its independence was that he was one of the few Americans with a good understanding of how the international credit system operated. Morris was thoroughly tied into it. Born in England, Morris migrated to America in his youth and proceeded to become one of America's most successful merchants. He understood the advantages of credit money convertible into a metallic base, and how it differed from the fiat paper issues of America. Morris also knew how England's securities markets worked, although few Americans used them because they saw their best investment opportunities in American land rather than English financial assets. Morris's financial experience accounts for his successes, first as a financial advisor to the Continental Congress and then as the Congress's superintendent of finance from 1776 to 1784.

Morris's accomplishments as a public financier were limited, however, because most members of the Continental Congress and the first state legislatures had nothing like Morris's experience in modern finance. These politicos disliked taxation, preferring to finance governmental spending by means of fiat paper issues. They and most other Americans then used fiat paper money, foreign coins, and specie as media of exchange and account settlement. With a few exceptions, Morris's attempts in the 1780s to modernize the financial system of the new nation and to deal with its large financial burdens left over from the successful War of Independence fell upon deaf ears. In 1784, the superintendent resigned in disgust and returned full-time to his business career.

What were the new nation's financial burdens and problems? The main burden left over from the War of Independence was a large national debt, both domestic and foreign, and the main problem was that there was almost no means of paying it, or even the interest due on it, because Congress lacked powers of taxation. The states also had debts that had been incurred for war purposes. Since states had tax and money-issuing powers, they could pay interest on their own debts. Some states even paid interest on national debts owed to state citizens.

The new United States also borrowed abroad. France provided substantial loans to the United States during the Revolutionary War. After the outcome of the war was evident, loans from Dutch bankers enabled the Confederation government of the 1780s to pay some of its obligations to Europeans, including the interest on previous loans.

The domestic national debt was essentially unserviced. So-called indents, representing arrearages of interest, were issued to Confederation-era creditors in lieu of the interest that was due. Securities representing the domestic debt of the United States changed hands at 10 to 20 percent of par value. Some of the states used fiat paper money issues and inflation

taxes to reduce the burdens of state and private debts. Others raised taxes to pay debts, provoking taxpayer resistance and even the armed rebellion of the Shaysites in Massachusetts in 1786–1787. Depressed economic conditions also led some states to put duties on imports from other states, provoking retaliatory actions. In the view of more than a few, the American experiment in its initial phases of nationhood did not seem to be working.

Such realizations led to the drafting in 1787 of a Constitution that created a new federal government with enlarged powers. Ratification of the Constitution came in 1788. The new federal government took over in 1789. Spearheading the movement for a stronger federal government were leaders who began to call themselves Federalists. These leaders of the new government launched a financial revolution for the United States that was very much like the Dutch financial revolution two centuries earlier and the English financial revolution a century earlier. In 1792, the forerunner of the New York Stock Exchange appeared and became a part of the securities-market component of the Federalist financial revolution.

The Federalist Financial Revolution, 1789–1795

When he became the new federal government's Secretary of the Treasury in 1789, Alexander Hamilton was the right man in the right place at the right time. During the Revolution, Colonel Hamilton had been the most trusted aide of General Washington, the new president, who appointed him Treasury secretary and supported his financial initiatives. With many lulls in the protracted fighting of the Revolution, Hamilton read widely, absorbing many of history's lessons. Grasping the advantages for national power of Dutch and British finance, as well as the deficiencies of French finance, Hamilton realized that the war dragged on as long as it did not because of any military weaknesses of the American revolutionaries on their home ground, but rather because their political and financial arrangements were fundamentally flawed. Both during and after the war, Hamilton shared these realizations in essay after essay, letter after letter, forum after forum, until the Constitution was written and ratified. Along the way, Hamilton became a confidante of Robert Morris, sharing in Morris's frustrations. He also worked with James Madison in the Confederation Congress, at the Constitutional Convention, and in writing the Federalist Papers explaining and defending the Constitution during the ratification debates.

On becoming Treasury secretary, Hamilton worked with Congress and other members of the executive branch to implement three key components of a modern financial system. First and foremost, it was necessary to implement a federal revenue system and use its proceeds to pay government expenses and interest on a restructured public debt. Congress responded to the challenge, initially with the tariff act of July 1789. Hamilton then formulated his debt-restructuring plan and presented it to Congress in January 1790. Congress, after considerable debate and some backroom dealing, approved the plan in July. Later in 1790, as old evidences of debt were exchanged for them, three new federal debt issues—a 6 percent, a deferred 6 percent (a "zero" for 10 years, after which it paid 6 percent), and a 3 percent bond began to appear in the nascent U.S. securities markets. A year later, $31 million of the new securities were outstanding, and two years after that, at the end of 1793, there had been issued $58 million of an eventual $64.5 million of the three new securities representing the restructured domestic national debt. The new debt issues paid interest quarterly in specie or specie equivalents. Their appearance gave life to securities markets in New York, Philadelphia, and Boston.

The modern national debt launched, in December 1790 Hamilton reported to Congress

his plan for a Bank of the United States. Congress adopted the plan in February 1791. The initial public offering of bank stock took place on July 4, 1791, and within hours it was oversubscribed. The bank's capitalization was $10 million, of which the federal government, by the plan's design, would take $2 million. The government paid for its shares with a loan from the bank.

Private investors absorbed the remaining $8 million of bank stock. They could pay for it over two years in specie ($2 million), and in the new federal debt issues ($6 million). Hamilton designed his grand plan so that the national debt and the bank would support each other, and so that the interests of investors in public debt and bank securities would be aligned with those of the fledgling federal government. Bank "scrips"—rights to subscribe to $400 full shares—issued in the IPO at $25 in July 1791 immediately became an object of intense speculation. They rose to more than $280 at New York in barely a month, before settling down to a $130 to $200 range later in the year.

The Bank of the United States opened its doors at Philadelphia, the temporary seat of the federal government, in December 1791, and began to open branches in other cities in spring 1792.[4] States, not wishing to cede banking to federal bank dominance, responded to the presence of the Bank of the United States and its branches by granting more state charters for banking corporations. Although the Constitution had taken away the rights of states to issue fiat paper money, states could still charter banks and tie them to state fiscal interests. Therefore, the loss of money-issuing prerogatives was not a setback for the states. Revenues from banks—charter fees, dividends, and taxes—quickly replaced the seigniorage revenues from issuing state paper money, and incidentally provided incentives for states to charter more and more banks.

In January 1791, Hamilton sent Congress his report on a mint, which Congress adopted later that year. The main significance of the report is that it defined the new U.S. dollar in terms of gold and silver as the nation's unit of account, making the U.S. monetary base like that of the leading European nations. Gradually the old state fiat paper issues were paid in to and retired by state governments. The convertible U.S. dollar joined the world's major currencies. Among its advantages, the convertible dollar helped make American securities, public and private, more attractive to both domestic and foreign investors.

Thus from 1789 to 1791, in barely two years' time, three key elements of a modern financial system—sound public finances and public debt management, a central banking institution, and a stable currency—were installed in the United States. And Alexander Hamilton's bold vision and implementation of his grand plan had induced the states to charter more banks and furnished the securities markets with tens of millions of dollars' worth of high-quality securities, both debt and equity. Historians of the United States dwell on the political controversies that accompanied this financial Big Bang. This has led them and their readers to miss the really important point, namely that the Federalist financial revolution was a giant step toward modernity in American economic life.

Why? It is essentially for the same reasons that the Dutch and English financial revolutions earlier energized those two economies, and later financial revolutions, in Meiji Japan, for example, would propel still other economies toward higher economic growth trajectories. Modern financial systems provide better payment mechanisms. They pool financial resources and subdivide shares and debts into units attractive to investors. They mobilize capital and allocate it with greater efficiency than premodern ones. They provide ways of managing and reducing risks. And they create a lot of useful economic information—securities prices, interest rates, and bond yields, for example—and use this information in the process of performing all their other functions.[5]

In the U.S. case, nearly two centuries of colonial development, despite a tremendous expansion of the population, yielded very little in economic growth of the modern variety, that is, sustained increases in per capita income and product. Colonial Americans lived quite well compared to people elsewhere in the world, mostly because they had a lot of land and other natural resources. But the colonial economy was short of capital—that is why interest rates were higher than in England and the Dutch Republic—and it also was short of financial liquidity except insofar as a tiny minority of merchants and planters could tap into the British financial system at its margins. These problems were painfully realized during and immediately after the War of Independence, which cut off what access Americans had to the British financial system. Fortunately, the Federalist financial revolution made these financial problems disappear, and the U.S. economy was quite different after 1790. It moved onto a higher growth trajectory, becoming during the following century the world's largest and most cutting-edge economy. Thus, the economic results of the Federalist financial revolution were more important in the long run than were the political controversies that surrounded its advent in the early 1790s.

The New York Securities Market and the 1792 Buttonwood Agreement

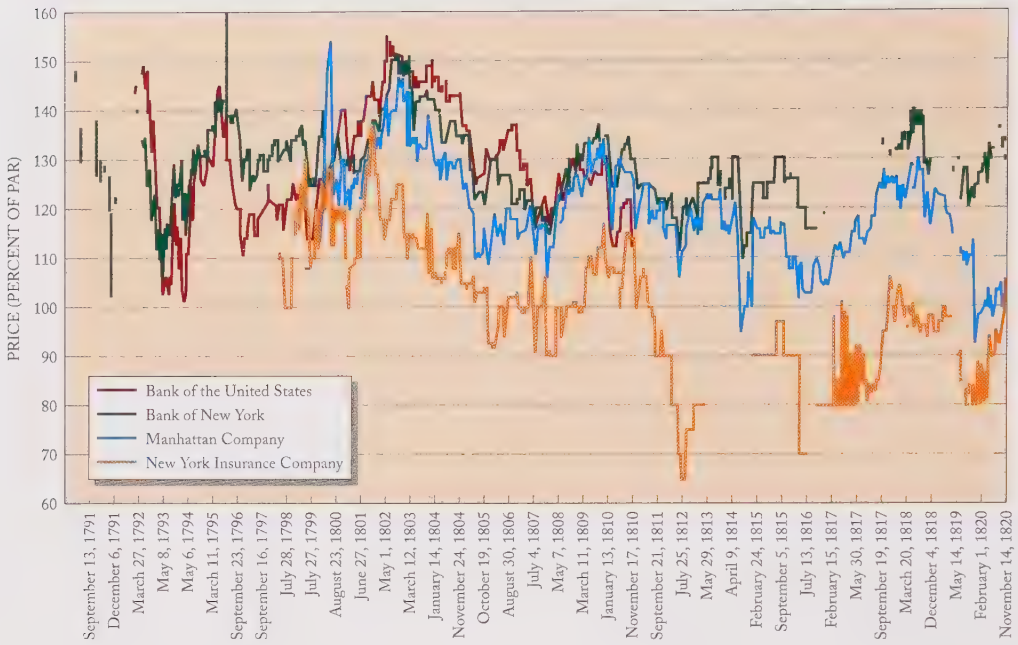
Modern U.S. securities markets had their genesis in the frenzied trading and speculation that arose in 1790 when Congress enacted Hamilton's debt-restructuring proposals, followed in 1791 by similar action on his proposal for a Bank of the United States. Together these measures introduced between $60 and $70 million of new, high-grade securities during the early 1790s, as the old public debt was voluntarily converted into the new 6 percent, deferred 6 percent, and 3 percent bonds, and as investors made payments for shares of the Bank of the United States. Price histories for the three new U.S. debt issues in the New York market from 1791 to 1820 are presented in graph 17.1. Graph 17.2 shows the price histories in New York of four equity issues, including that of the Bank of the United States, for the same period.[6] There are some gaps in the data, indicating either an absence of data sources or an absence of quoting or trading in a particular issue. But the figures demonstrate that the earliest years of the United States contain a rich history of securities markets. That history is one major consequence of the Federalist financial revolution.

U.S. securities-market history is by no means confined to New York. Philadelphia and Boston also had securities markets, and the data are there to produce similar figures for those markets. All three cities quoted and traded the three federal debt issues and bank stock. These were the national-market securities of the 1790s and early 1800s. Allowing for communications lags—it took a day or two for information to travel between New York and Philadelphia, and several days to a week between New York and Boston—there is ample evidence in the price histories and contemporary archival records that arbitrage operations took place among the three markets. Prices of national-market securities were similar, and moved similarly, in all markets. The Federalist financial revolution led to efficient capital allocation mechanisms for the U.S. economy in its earliest years.

There is also evidence that from 1790 on, New York was the leading market. In April 1790, Philadelphia broker Clement Biddle wrote a correspondent that securities prices "are and will be for some time governed by New York," and in June 1791, Boston merchant Stephen Higginson wrote his New York correspondents that Boston securities prices "will depend chiefly on the course of the York market."[7] From the first years of active American securities trading in the early 1790s, New Yorkers—perhaps because of their combined

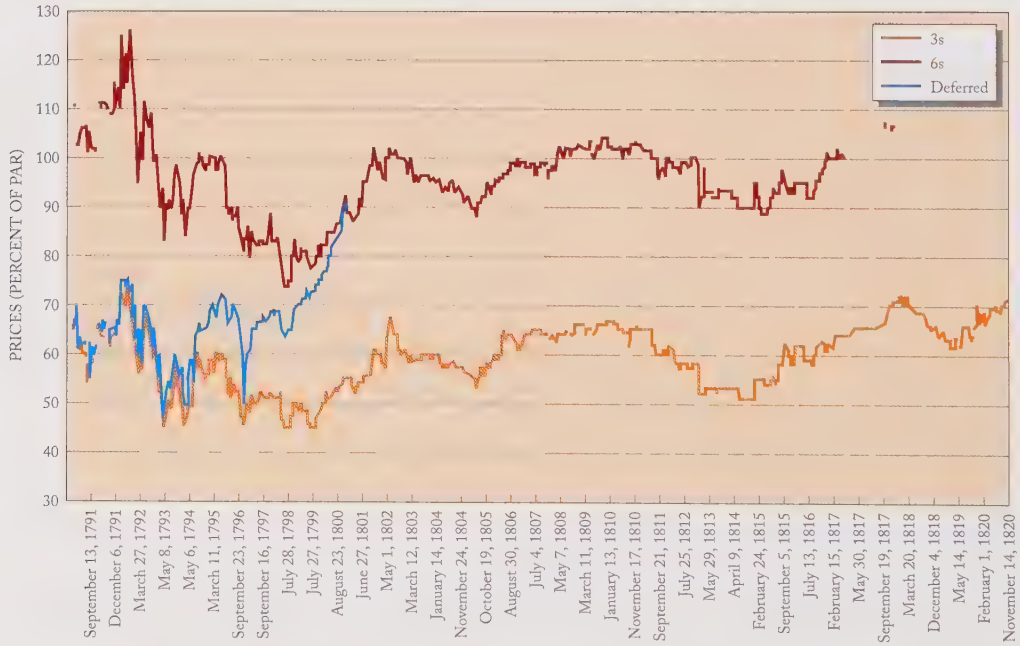
GRAPH 17.1.

SELECTED EQUITIES PRICES, NEW YORK, 1790–1820



GRAPH 17.2.

U.S. DEBT PRICES, NEW YORK, 1790–1820



Dutch and English heritages—appear to have been more speculative and risk-taking market participants than their counterparts in Boston and Philadelphia. New York also had an advantage over the other cities because it appears that most foreign purchases and sales of American securities were executed there. New York from the start therefore had the highest trading volume of the three cities, the most active and liquid market, and the closest ties to foreign investors. These initial advantages of New York grew over time.

The enlarged volume of securities trading born of Hamilton's debt and bank measures undoubtedly drew new participants—auctioneers, brokers, dealers, and investors—into the markets. Increased trading and more participants created new problems of trust and the honoring of contracts. Since the securities business was relatively new, its legal status was unclear. In the circumstances, groups of participants searched rules to govern conduct and ways to regulate the new trade. A group of dealers met at a coffee house on September 1, 1791, and "agreed to be governed" by a set of fourteen rules that were published in a broadside. Some represented attempts to cartelize the business, while others dealt with contract enforcement and provided sanctions for defaulters on contracts.[8]

As the two early New York securities price graphs indicate, frenzied trading in late 1791 and early 1792 drove prices to lofty levels. Then, in February and March 1792, Wall Street suffered its first crash. The mayhem spread quickly via arbitrage to Boston and Philadelphia. An oft-repeated explanation of the crash is that a cabal of speculators and brokers led by William Duer, who earlier had worked at the Confederation Treasury Board and stayed on for some months at the new Treasury Department under Hamilton, hatched a plan late in 1791 to corner some of the new securities issues. Duer and his associates used their own wealth and whatever they could borrow from others to go long, and then they were wiped out when prices declined and they could not meet their engagements to repay their loans. Duer defaulted on his debts in March 1792 and went to jail, setting off a chain reaction of panic selling.

A more recent interpretation of the 1792 bubble-crash scenario is that the Bank of the United States, immediately on opening for business in December 1791, flooded the channels of trade and investment with its banknotes, and then—perhaps at the suggestion of Hamilton, who sensed the bubble building up and called upon banks *gradually* to contract credit—the Bank of the United States stepped *hard* on the brakes, precipitating the crash.[9] The two interpretations are not inconsistent; indeed, they may reinforce one another in accounting for the magnitude both of the bubble and its bursting. Whatever the case, the New York investment community was devastated.

Amidst the devastation, the record shows that another group of "Merchants and Dealers in Stocks in the City of New York" met on March 21, 1792, and appointed a committee "to provide a proper room for them to assemble in after April 21, and to report such regulations relative to the mode of transacting business, as in their opinion may be proper."[10] Before the committee of this group could report, the New York legislature, in response to the crash, on April 10 passed "An Act to Prevent the Pernicious Practice of Stock-Jobbing, and for Regulating Sales at Public Auction." The act banned public auctions of securities and also made contracts unenforceable for sales, transfers, or wagers (sometimes called time bargains) on the future price of government debt and company equity shares, unless the securities in question were actually owned by the seller or wagerer.[11]

On the face of it, this legislation represented a major setback to New York securities brokers, dealers, and auctioneers. It undercut the basis of most of their business and threatened them with sanctions if they went on as before in their securities dealings. What were these securities professionals to do to stay in business? A group comprising twenty-four of

them, mostly individuals but a few partnerships as well, met, according to legend, under a buttonwood tree in Wall Street on May 17, 1792, and made a simple, one-sentence agreement to give preference to each other in their dealings, and to fix brokerage commissions at a minimum of one-quarter percent. In other words, in "the Buttonwood Agreement," the group of twenty-four had formed a club to do privately what the law no longer allowed them to do in public. Ten of the signers identified themselves as merchants, nine as brokers, and the remaining five were identified as insurance brokers, auctioneer and broker, insurance and stock broker, stock brokers and auctioneers, and warden of the port.[12]

Around the same time, the New York Tontine Coffee House Company was chartered to provide a Merchants Exchange, and among its 203 subscribers were members of the club formed under the buttonwood tree. The Tontine Coffee House was completed in 1793, and it likely became the meeting place for the club.

The New York Stock Exchange and many writers claim that the exchange grew out of the 1792 Buttonwood Agreement. Others deny this on grounds that the evidence in favor of it is at best circumstantial and that in any case securities trading in New York dwindled after the crash of 1792 and did not revive to any great extent until after the War of 1812.[13]

The latter contention appears to be refuted by the weekly data presented in the two graphs indicating that government debt and corporate stocks were regularly traded in New York between 1791 and 1820. The New York securities market operated continuously after the crash of 1792. The Buttonwood Club was by no means the only group meeting to trade securities in New York City in that period. Even today, of course, the NYSE is not the only securities exchange in the city.

Moreover, when the New York Stock and Exchange Board (which all agree later became the NYSE simply by altering its name) emerged in 1817, four of its twenty-some original members were among the twenty-four who had signed the Buttonwood Agreement twenty-five years earlier.[14] Careers and life expectancies were shorter two centuries ago. Given the passage of time, which could have allowed many of the original buttonwood signers to move away, change occupations, retire, or pass on, this evidence, along with that showing fairly continuous trading activity after 1792, would appear to make it more than circumstantial that the Buttonwood Agreement constituted the origin of the NYSE.

In terms of historical significance, the debate over whether the Buttonwood Agreement of 1792 marked the origin of the NYSE is trivial. The significance of the various attempts in 1791 and 1792 to provide more organization and rules for securities trading is that they reveal a flawed initial trading system. In the outdoor street auctions that flourished as U.S. securities markets were born, traders discovered that they could not always, or even often, be sure of the identity and reliability of the counterparty to a trade. The collapse of William Duer and his associates in March and April 1792 drove home that lesson, both to securities traders and the New York State legislature. Both responded, the legislature with a seemingly draconian law and the traders with a new, club-based trading system in which members of the club would know and could rely on each other. Thus, the Buttonwood Agreement and others like it corrected flaws in the initial trading system for securities. These corrections allowed the markets to continue and to flourish. That is the real significance of the events of 1792.[15]

The New York Stock & Exchange Board

In February 1817, twenty-four brokers met at the office of Samuel Beebe, one of the four of those present who had signed the Buttonwood Agreement twenty-five years earlier,

and resolved that it was "desirable to constitute a Board or Association of Brokers in this city for the transaction of business at their Board." They appointed three of their number to draw up articles of association. The minutes listed members present and absent, indicating that the group was not a new one. It may have been the successor group to the Buttonwood signers of 1792. In a fortnight, the articles of association were drawn and adopted.[16] The association adopted the name New York Stock and Exchange Board, and the articles were a set of nineteen rules that all the members were to observe.

It is likely that there were two broad motivations for a more formal organization of brokers. First, a growing list of securities and increased trading volumes meant that the club would find it advantageous to admit new members. But that would increase the settlement risks faced by each member—a negative network externality—in the absence of rules for settling disputes. Second, the New York law of 1792 remained on the books, meaning that the brokers could not have reliable recourse to the courts for resolving disputes except in cases involving simple transactions. To carry on their expanding business, the brokers thus required more self-regulation by the club, and that is what the formal rules made possible. The New York Stock and Exchange Board rules continued the 1792 tradition of fixing transactions costs, that is, minimum commission rates.

That the number of securities traded in New York, as reported in contemporary newspapers, expanded with time can be seen in Table 17.1, showing the lists in five benchmark years from 1797 to 1832. The lists report the largest and most actively traded issues, the sorts of securities the NYSE has specialized in for two centuries. Many other issues were too small or too inactively traded to make it into either newspaper quotations or the NYSE official listings. The listings that were reported in newspapers expanded rapidly in the years after 1817. The New York brokers therefore were probably wise in that year to make the rules of their securities exchange more formal.

Brokers who wanted to join the exchange had to be vetted, and they had to pay a membership fee for their seats. But as the legal historian Stuart Banner notes, there were substantial benefits to membership. A member had access to orderly price-discovery procedures, numerous other brokers, and low transactions costs. Since potential members were vetted, a member could have some confidence in the reliability and creditworthiness of other members, as well as rule-governed procedures for settling disputes between members. There was contract enforcement. And, since the members trusted each other, their reputation for fair dealing was helpful in attracting outside customers to the exchange. A well-run stock exchange can become a trusted brand. Finally, members of the exchange had access to current securities price information before anyone else did. That "inside information" had value to them.[17]

Within a decade after the formal exchange organized in 1817, it began to reap another long-term advantage from its location. Because New York was the leading port of the United States, an advantage enhanced by completion of the Erie Canal in 1825, demand for New York funds expanded throughout the country. Banks in other cities and the interior began to keep balances in New York banks to meet their clients' demands. New York banks needed to be liquid to meet potential demands for these balances, as they constantly flowed into and out of the banks. The banks discovered a near-ideal employment of outside bankers' balances, one that would be liquid and yet profitable. They began to make call loans on securities collateral.[18] Call loans on securities were generally a safe use for bank reserves. When a loan to a securities investor or dealer had to be called, the borrower could roll it over into another call loan or liquidate the securities collateral at the exchange to meet the call. Since securities-market participants paid interest on call loans,

TABLE 17.1. SECURITIES LISTED AND QUOTED IN NEW YORK 1797–1832

1797	1801	1811	1817	YEAR-END 1832
Governments				
U.S. 6 percents	U.S. 6 percents	U.S. 6 percents	U.S. 6 percents	U.S. 5 percents (1835)
U.S. 3 percents	U.S. 3 percents	U.S. 3 percents	U.S. 3 percents	U.S. 4.5 percents (1832, 33)
U.S. Deferred 6 percents	U.S. Navy 6 percents		Louisiana 6 percents	U.S. 3 percents
	U.S. 8 percents		U.S. 7 percents	New York Canal 6 percents (1837, 1845)
			Yazoo/Mississippi (U.S.)	New York Canal 5 percents (1837, 1845–47, 1850)
			New York State 6 percents	New York 4.5 percents
			New York State 7 percents	Ohio 6 percents (1850)
			Corporation 6 percents (New York City)	Ohio 5 percents (1850)
				Corporation 5 percents (1850)
				Mississippi 6 percents (1841, 46, 51, 56)
				Alabama 5 percents (1852)
Banks				
Bank of United States	Bank of United States	Bank of United States	Bank of United States	Bank of United States
Bank of New York	Bank of New York	Bank of New York	Bank of New York	Bank of New York
	Manhattan Bank	Manhattan Co. Bank	Manhattan Co. Bank	Manhattan Co. Bank
		Merchants Bank	Merchants Bank	Merchants Bank
		Union Bank	Mechanics Bank	Mechanics Bank
		Mechanics Bank	Union Bank	Union Bank
			Bank of America	Bank of America
			City Bank	City Bank
			Phoenix Bank	Phoenix Bank
				North River Bank
				Tradesmen's Bank
				Chemical Bank
				Fulton Bank
				Del & Hudson Canal Co.
				Del & Hudson Bonds
				Drydock Bank
				Greenwich Bank
				Butcher's & Drover's
				Mechanics & Traders
				National Bank
				Merchants Exchange
				Leather Manufacturers
				Long Island
				Brooklyn
				Morris Canal & Banking Co.
				Life Ins. & Trust Co.
				Louisiana
				New Orleans Canal & Bank
				New Orleans City Bank
				City Bank of New Haven
Insurance				
	New York Insurance	New York Insurance	United Insurance	MARINE
	Columbian Insurance	Columbian Insurance	New York Insurance	New York Insurance
	United Insurance	United Insurance	Fireman Insurance	Ocean Insurance

1797	1801	1811	1817	YEAR-END 1832
Insurance, continued				
		Marine Insurance	Ocean Insurance	American Insurance
		Commercial Insurance	Phoenix Insurance	National (old)
		Phoenix Insurance	American Insurance	National (new)
		Eagle Insurance	Pacific Insurance	Union Insurance
		Mutual Insurance	Mutual Insurance	Atlantic Insurance
		Ocean Insurance	Washington Insurance	Neptune Insurance
		New York Fireman Insurance	Eagle Insurance	State Insurance
			Globe Insurance	Jackson Insurance
			National Insurance	Commercial Insurance
				FIRE
				Mutual Insurance
				Washington Insurance
				Eagle Insurance
				Globe Insurance
				Franklin Insurance
				Merchants Insurance
				Fulton Insurance
				Manhattan Insurance
				North River Insurance
				Farmers Loan Insurance
				Equitable Insurance
				Phoenix Insurance
				Jefferson Insurance
				United States Insurance
				Contributionship Insurance
				Aetna Insurance
				Traders Insurance
				Howard Insurance
				Firemen's Insurance
				Brooklyn Insurance
				Clinton Insurance
				New York Insurance
				American Insurance
				Palladium Insurance
Railroads				
				Mohawk Railroad
				Mohawk Rail Branch
				Peterson & Hudson RR
				Canajoharie & Catskill
				Saratoga Railroad
				Harlem Railroad
				Boston & Providence
				New York & Albany
				New Jersey & T Line
				Camden & Amboy
Miscellaneous				
				New York Gas Light Company
				New York Schuylkill Coal Company
				Merchants Exchange
				Congress Sugar Refining Company

Source: New York Price Current, 1797–1817; New York Shipping List, 1832

the banks could pay interest to outside banks making deposits in New York. Payment of interest on bankers' balances drew still more funds from banks outside of New York to the New York money market.

The New York exchange by the 1820s most likely was the dominant U.S. securities market, and evidence already cited indicates it may have been so from the 1790s. During and after the 1820s, as New York banks became more numerous and larger, they attracted more bankers' balances than any other city, and they employed these funds to finance securities trading. This enhanced the liquidity of New York securities trading, and helped the New York Stock and Exchange Board to solidify its lead over other city securities markets. By the mid-nineteenth century, the other securities markets were either local markets or vassals of the New York exchange.

At the same time, the presence of the largest U.S. stock exchange was a boon to the banks of New York. The banks could reap the spread between call loan rates and the rates they paid on bankers' balances flowing into New York through the expanding U.S. banking system. The New York banks, the U.S. banking system, and the NYSE were thus bound together in a synergistic relationship that, apart from financial crises, redounded to the benefit of all of them.

Conclusion

Why did the New York securities market and the NYSE become dominant in the United States, and eventually the largest in the world? If, as some evidence suggests, it was true from the beginnings of the modern markets in the early 1790s, then it must have been the result of the city's combined Dutch and British heritages of financial innovation and entrepreneurship, and the advantages of New York as a port in comparison with other seaboard cities.

If New York's dominance in securities trading did not come until the 1820s or 1830s, other developments explain why it happened then. The Erie Canal, begun in 1817 with bond funding and completed in 1825, contributed greatly to the city's trade in both commodities and securities. The New York innovation of scheduled packet shipping lines in 1817 regularized and shortened communication times between U.S. and European markets, including securities markets. Reforms of New York's auction rules in 1817 guaranteed that high bidders would always get the goods in New York, which they could not count on in other cities' auction markets. Adding in bankers' balances and the call-loan mechanism, two innovations also introduced at that time, it becomes apparent why the New York exchange increasingly outdistanced its rivals.

The contention of some historians that New York shot ahead of other cities' securities markets only after Andrew Jackson in the 1830s vetoed renewal of the federal charter of the Philadelphia-headquartered Second Bank of the United States and distributed government deposits to state banks does not seem plausible. Philadelphia was an important financial center, but for a host of other reasons New York already had become the dominant securities market before Jackson's veto. As demands for large-scale securities and bank financing emerged in decades subsequent to the 1820s, New York was in the best position to meet them. It was the largest city in population. It was the nation's leading port. It had the largest banks, drawing in bankers' balances from throughout the U.S. banking system to fund the securities call-loan market. And it had the NYSE.

18

The First "Eurobonds"

The Rothschilds and the Financing of the Holy Alliance, 1818–1822

NIALL FERGUSON

The term "eurobond" entered financial parlance in the 1960s to describe the dollar-denominated bearer bonds that came to be not just traded but also issued in European financial markets, principally London. Siegmund Warburg is usually credited with the creation of this new market, which flourished during the 1960s and 1970s as restrictions on bond issuance by foreign corporations in New York were tightened.[1] However, the idea of issuing bonds for a government or company in a market and a currency other than the issuing entity's dates back much further than 1963, the year of the first eurobond issue arranged by Warburg for the Italian highway authority Autostrade. Consider one typical modern definition of a eurobond: "The bonds may or may not be denominated in the currency of the issuer's domestic jurisdiction and the bonds are sold to investors located in different countries rather than to investors in the place of issue."[2] In fact, that definition could perfectly well be applied to two major bond issues that took place nearly a century and a half before the Autostrade loan. Indeed, it is not far-fetched to describe the loans issued by the Rothschild brothers for Prussia and Russia in the aftermath of the Napoleonic Wars as the first true eurobonds. These loans ushered in an era that would last more than a century, until the Great Depression, during which a substantial proportion of sovereign bond issues were, in practice if not in name, eurobonds; that is to say,

they were denominated in currencies and issued in financial markets other than those of the issuing country.

What the Rothschilds did was not in every respect novel. In the mid-eighteenth century, as James C. Riley has documented, at least seven governments raised loans in the Amsterdam market that were denominated in guilders, the Dutch currency. They were Austria, Denmark, Sweden, Russia, Poland, Spain, and the United States.[3] Lively secondary markets existed in Amsterdam for at least some of these loans. Even when one of these countries issued bonds denominated in its own currency—for example in 1803, when the United States issued more than $11 million of 6 percent dollar bonds to pay for the Louisiana territory—the bonds contained an explicit exchange rate clause fixing the dollar in terms of Dutch guilders (at the rate of 2.5 guilders).[4] (In the eighteenth century only two countries besides the Dutch Republic itself were able to issue bonds denominated in their currencies with any expectation that Dutch investors would buy them: Britain and France.)[5] The problem often referred to by economists as "original sin"—the fact that a few countries are able to issue own-currency bonds abroad but most cannot—was not unknown before 1818.[6] Moreover, other banks had been doing such business for many years before the Rothschilds burst onto the financial scene in the closing years of the Napoleonic Wars. The Louisiana 6 percents were sold to investors by the London-based house of Baring and Hope and Co. of Amsterdam, at a time when Nathan Rothschild was still a textiles merchant in Manchester.

Yet within two decades Nathan Rothschild and his brothers made two important improvements to what had been pioneered in Amsterdam. First, they introduced the issuance of sterling-denominated foreign government bonds to the London market. The bonds issued by the Rothschilds in 1818 and 1822 would become the template for initial public offerings of sovereign bonds for more than a century—a century that would see London flourish as a center for cross-border capital flows on a scale undreamt of in eighteenth-century Holland. Second, because of their distinctive structure as a multinational entity operating in five different financial centers in five different countries, the Rothschilds were able to experiment with the idea of making a single initial public offering in more than one market with more than one interest-payment mechanism for investors. A close examination of the negotiations leading up to the issues of 1818 and 1822 substantiates the claim that it was the Rothschilds who established one of the crucial financial instruments of the first age of globalization.[7]

Owned and run as a private family partnership but operating in multiple financial centers, the Rothschild bank was the largest and most powerful financial institution of the nineteenth century. The original "house" of M.A. Rothschild had been founded in Frankfurt by Mayer Amschel Rothschild in the 1790s. Originally a dealer in coins and other antiquities, Mayer Amschel had become a broker and later investment manager to Wihelm IX, the wealthy prince (later elector) of Hesse-Kassel. By 1797 Rothschild had already accumulated capital of around £10,000 and was extending credit to a wide range of German clients. When the elector fell out with Napoleon and was driven into exile, Mayer Amschel continued to help manage his fortune—which included a substantial portfolio of British bonds domiciled in London—despite the attendant risk of arrest by the French authorities.

None of this, however, was exceptional. Mayer Amschel was just one among many German-Jewish *Hoffaktoren* ("court Jews") offering financial services to petty princes. Nor was his decision to send his third son Nathan to England in 1799 especially unusual. The rapid growth of industrial textile manufacturing in England attracted numerous German

merchants eager to purchase the new Lancashire fabrics for shipment to the continental market. This too became a risky enterprise following Napoleon's imposition of the Continental System. Even Nathan Rothschild's decision in 1811 to involve himself in British war finance was unoriginal. Since the late seventeenth century British government borrowing—both long-term through the stock exchange and short-term from the money market—had attracted foreign financiers to London. The Rothschilds' mobilization of their continental credit network to relay bullion to the British armies in the field in France in 1814 and 1815, as well as to transfer subsidies to Britain's continental allies, was remarkable only for its scale. The risks were commensurate. Contrary to legend, Nathan and his four brothers—Amschel, Salomon, Carl, and James—were brought to the brink of insolvency by the news that Napoleon had been defeated at Waterloo, since they had accumulated gold reserves in the expectation of a prolonged war. Nathan's immense and speculative purchases of British government bonds in the aftermath of Waterloo not only salvaged the situation but also reaped a huge profit. By 1818 the Rothschilds' combined capital amounted to nearly £1.8 million. From the 1820s until the outbreak of the First World War, their banking partnership had the largest single concentration of financial capital in the world.

Prior to 1818, the Rothschilds' mode of operation had in fact been surprisingly crude, albeit very effective. Their bookkeeping was chaotic. They drew up balance sheets at infrequent intervals. They spurned the double-entry method. At times the partners altogether lost sight of what cash they had in hand. Their notionally confidential correspondence was often intercepted and, although written in *Judendeutsch* (German transliterated into Hebrew characters), deciphered by the Austrian authorities. Nevertheless, under Nathan's mercurial leadership, and on the basis of the funds they had accumulated during the war, the Rothschilds now began to play a more innovative role, specifically in the integration of the European capital markets. A crucial advantage they enjoyed over their longer-established rivals lay in the unusual form of the Rothschild bank itself. Although it remained a family firm—structured as a partnership between adult male family members—the Rothschild bank gradually took on a multinational character, in that the five brothers came to be based in five major European financial and political centers: Frankfurt, Vienna, London, Naples, and Paris. This allowed them to cater much more easily than any previous banking institution for clients—and particularly investors in government bonds—whose interests were also international.

The system whereby European states funded a part of their budget deficits by selling long-term interest-bearing bonds to an international elite of investors through financial intermediaries was, as we have seen, well established before 1818. The Amsterdam market had made life easier for investors by issuing and trading a wide range of guilder-denominated securities, but the wars of 1793 to 1815 dealt heavy blows to the Dutch system. Revolutionary France defaulted on most of the monarchy's debts, printed money incontinently, and then shifted to conquest and exploitation to fill the gap between domestic tax revenues and expenditures. The Austrians turned to London in 1794 but defaulted on the loan they raised there just three years later and, in 1804, announced that future payments on earlier Dutch loans would take place in Vienna and would be made in paper money; by 1811 that currency had depreciated by 88 percent and the country was bankrupt.[8] French subjugation and, in 1810, annexation left the Dutch bankrupt too.[9] The Russians only narrowly avoided the same fate by negotiating major conversions of their external debt in 1797 and 1815, the latter operation coming after two years in which debt service had been unilaterally suspended.[10] According to Richard Hellie,

> From 1801 to 1809, [Russian] governmental expenditures annually exceeded income by one-third, a deficit covered by printing paper money and borrowing from treasury credit institutions. . . . The deficit for the years 1812 to 1814 amounted to 360 million rubles and was covered by printing paper money (191 million), internal loans (47 million), English subsidies (42 million), and other sources (89 million).[11]

All of this helps to explain why the center of European financial gravity moved across the Channel from Amsterdam to London. Thanks to buoyant economic growth and the success of the new income tax, the British ceased to need help from Holland to fund their huge but low-interest national debt. Yet precisely the scale of Britain's domestic bond issuance during this period postponed any new attempt to issue foreign bonds in London. In the light of the Austrian default, the British concluded that their continental allies might as well be paid explicit subsidies, rather than lent money they would in any case never repay.

The task confronting the Rothschilds was therefore to educate a British bond market bloated by domestic issuance to contemplate postwar loans to foreign governments. When Nathan Rothschild moved to London his principal business was initially to manage the elector of Hesse-Kassel's portfolio of British bonds. He discerned, however, that such capital imports to London would be much less important than capital exports from London once the fighting finally ended.

Four things prompted the Rothschilds' invention of what would much later be called the eurobond. First, despite the crucial role they had played in financing the British war effort against Napoleon after 1812, they were largely excluded from the financial transactions that arose from the Congress of Vienna, in particular, the loans to enable the restored Bourbon regime in France to pay reparations totaling 700 million francs and additional occupation costs. This transaction was financed, as the Louisiana purchase had been, by the Barings (who by this time had effectively taken over the shell of Hope & Co.).[12] The mechanism they chose was to issue perpetual franc-denominated rentes in three markets: Paris, London, and Amsterdam. (More than half—57.6 percent—were sold in the home market at a yield of 8.41 percent. In London and Amsterdam, by contrast, the yields were higher—by 43 and 66 basis points respectively.)[13] Aggrieved at having been shut out of this deal, the Rothschilds resolved to find new sources—and new methods—of business.

Second, and opportunely for the Rothschilds, the other great powers of Central and Eastern Europe—Austria, Prussia, and Russia, now leagued together as the "Holy Alliance"—found themselves in grave financial difficulties as soon as Britain's wartime subsidies to them were discontinued. We have already seen the difficulties that beset bankrupt Austria and near-bankrupt Russia. Prussia, which had previously exploited royal domains and hoarded treasure rather than borrowing abroad,[14] was little better situated. Between 1794 and 1815, the Prussian domestic debt had risen from 38 million to 206 million thalers.[15] The state continued to run large deficits in the three postwar years and by late 1817 had a floating debt of around 20 million thalers.[16] Despite French reparations payments, these problems were so serious that they could be overcome only with the assistance of major stabilization loans. As the Rothschilds' intimate friend Benjamin Disraeli later put it in his novel *Coningsby*, "[A]fter the exhaustion of a war of twenty-five years, Europe must require capital to carry on peace. . . . France wanted some; Austria more; Prussia a little; Russia a few millions."[17] Moreover, the foreign policy of the Holy Alliance was bound to create additional financial needs, since the principal aim of the Al-

liance was to avert a recurrence of the revolutionary "epidemic" that had caused such upheaval in Europe between 1789 and 1815—if necessary by military intervention, which of course implied further expenditure.

A third key factor was the significant depreciation of the currencies of the Holy Alliance countries during the period of intermittent war with France—much more than had been the case for either sterling or the French franc. Even if they had not dipped in value, the gulden, the rouble, and the thaler lacked the international "vehicle currency" status of these two currencies. There were simply not enough international commercial transactions in the Austrian, Prussian, and Russian currencies to make them sufficiently liquid in the eyes of international investors.[18] Finally, and crucially, the domestic financial markets of Prussia and Russia were clearly quite unequal to the task of floating major loans. For all these reasons, the Rothschilds began to think in terms of issuing bonds for the Holy Alliance in a foreign market—London—and in the currency of that market—sterling.

The comparative weakness of the Berlin and St. Petersburg markets was arguably the crucial factor. Austria, too, had huge deficits and a weak currency, but the Vienna market, in conjunction with the closely associated Frankfurt market, was at that time still able to meet the Austrian government's needs within the confines of the German Confederation.[19] The first major postwar Austrian loan of 50 million gulden was issued—much to the Rothschilds' chagrin—by the Anglo-Hanseatic Parish brothers in partnership with Baring, Bethmann, and Geymüller. But this was a traditional Austrian loan denominated in Austrian currency and issued in markets within the traditional Habsburg sphere of influence.[20] The same was true in 1820, when Salomon Rothschild jointly organized two lottery loans worth 45 million Austrian gulden (£4.8 million) in partnership with David Parish—a transaction so profitable that despite the hostile comment it aroused, Salomon thereafter resolved to remain in Vienna on a more or less permanent basis.[21] In doing so he was continuing a long-standing tradition whereby the Habsburg monarchy entrusted its finances partly to an elite of court Jews, who in return received legal privileges (such as the right to own real estate) denied to other Jews within the Empire. It was therefore in Prussia and Russia, not in Austria, that the Rothschilds were forced to be innovative, precisely because these two were great powers only in the military and diplomatic sense, but not in financial terms.

Although the Frankfurt-based Rothschilds had already arranged a small Prussian loan of 5 million gulden (about £450,000) in early 1817,[22] it was apparent by the end of the year that only a loan raised in London would suffice to meet the monarchy's needs. The German markets were simply too small.[23] In the words of Amschel Rothschild, who had run the Frankfurt branch since his father's death in 1812, a state that was obliged to pay 12 percent interest on its borrowings was living on borrowed time as well as money.[24] The idea for a British loan in fact originated with the representative of the Prussian Seehandlung bank in London, a merchant named Barandon. But the Prussians initially had in mind a 10 million thaler loan for a period of only four years, with total charges (including interest and commissions) not to exceed 7.5 percent of the capital sum.[25] The Rothschilds had very different ideas. First, they legitimately expected Prussia to pay more than 7.5 percent: Nathan initially envisaged taking 5 percent bonds at a price of 60, implying a current yield of 8.33 percent, and then issuing these at just over 70, implying a yield to investors of 7 percent and a handsome spread for the Rothschilds. Second, they wanted the loan to be issued in the form of bearer bonds, as opposed to registered bonds like French

rentes, purchasers of which had their names inscribed in a "great book."[26] This was because, as Nathan explained,

> The capability of lodging at any time and moment a document which shall convey to the holder the actual prospect [of ownership and payment of interest], is so important in a Country where the daily use and application of money is so understood, as it is here, that it cannot fail to give a superiority to this, over all other foreign loans we contracted for . . . and would, in all probability, in a short time raise the original rate [i.e., reduce the yield by putting up the price] of about 7 percent interest p[er] annum to 6 or 5 percent, than which nothing would be more advantageous to the first takers and contractors for the loan and for every further issue to the Prussian government itself.[27]

Third, they intended the loan to be for a period of thirty-six years, not in perpetuity. Fourth, and crucially, they envisaged that it would be denominated in sterling, to a nominal value of £3 million. Fifth, interest would be payable in London; it would be the responsibility of the Seehandlung to transfer the requisite sums to the Rothschild bank there. Finally, Nathan did not regard the proposed mortgage on the Prussian royal estates and revenues as sufficient security. He wished to see to the creation of a sinking fund in London beginning with the immediate investment of £150,000 in English government bonds, to accumulate through annual payments and compound interest until the extinction of the debt.[28] Such sinking funds had been a recurrent feature of British government borrowing since the 1720s.

When Barandon prematurely published details of Nathan's proposed terms in January 1818 they provoked an outcry in Berlin, where the local bankers tried to put together a better offer.[29] Berating Nathan for having involved Barandon, whose reputation in Paris was that of a small-time commodities dealer, Salomon hastened from Paris to Koblenz for fraught talks with the Prussian state chancellor, Prince Karl August von Hardenberg. At the latter's request, he then proceeded to Berlin, where he and Carl neutralized the local competition by promising the German bankers that they could have a share of the issue.[30] With the connivance of the Prussian ambassador in London, the great educational and political reformer Wilhelm von Humboldt, Barandon was quietly sidelined—though it was not until after five days of continuous bargaining with Christian Rother, the director of the new Prussian Treasury, that an agreement was finally secured. The final terms, settled in London at the end of March, were that 5 percent bonds with a total nominal value of £5 million would be issued in denominations ranging from £100 to £1,000. Repayment was to take place over twenty-eight years, and a sinking fund was to be established.[31] It was further agreed that the bonds would be sold in three successive tranches, with the price rising from 70 (i.e., 30 percent below face value) for the first £2.5 million to 72.5 for the second tranche of £1.25 million and 75 for the third tranche of £1.25 million. At Rother's suggestion, £1 million of the first tranche was in fact taken by the Prussian government itself. Officially, there was to be no additional commission; in reality, however, Nathan got his 4 percent, though this was "kept secret" to defuse criticism in Berlin. In addition, the Rothschilds kept at least £1.5 million for themselves, netting a large profit when the price rose to a peak of 85 (15 percent below par) after the initial public offering. (This helps to explain why the brothers wrote in such affectionate terms to Rother after the contract was concluded. Salomon assured him that he and Nathan were his "heartfelt, eternal and faithful good friends"; it

is unlikely that he would have expressed such sentiments if he had been forced to forgo a commission.[32])

Historians have long claimed that the Prussian government's decision to raise a loan in London had an ulterior motive: to avoid the need for political concessions—such as the summoning of an assembly of the estates (*Stände*) or the creation of an independent judiciary—which recourse to domestic sources of finance might have necessitated.[33] However, the Rothschild correspondence tells a rather different story.[34] At the outset of the negotiations, as we have seen, Nathan argued that any loan would have to be secured not only by a mortgage on Prussian royal domains but also by a sinking fund. This sinking fund, he proposed, should be administered by a committee of seven, of whom four should be independent of the government. In a remarkable memorandum, Nathan spelled out the thinking behind this unusual proposal:

> [T]o induce British Capitalists to invest their money in a loan to a foreign government upon reasonable terms, it will be of the first importance that the plan of such a loan should as much as possible be assimilated to the established system of borrowing for the public service in England, and above all things that some security, beyond the mere good faith of the government . . . should be held out to the lenders. . . . Without some security of this description any attempt to raise a considerable sum in England for a foreign Power would be hopeless[;] the late investments by British subjects in the French Funds have proceeded upon the general belief that in consequence of the representative system now established in that Country, the sanction of the Chamber to the national debt incurred by the Government affords a guarantee to the Public Creditor which could not be found in a Contract with any Sovereign uncontrolled in the exercise of the executive powers.[35]

In other words, a constitutional monarchy was seen in London as a better credit-risk than a neoabsolutist regime. Was this a subtle form of political pressure—a kind of financial liberalism, lending its weight at a critical time to the efforts of the Prussian reformers who had been pressing Frederick William III to concede some form of popular representation? Or was Nathan merely seeking to justify the difference between his terms and those obtained by France from Baring? James's positive allusion in a letter to Nathan to the (notional) ability of French deputies to go to the Treasury and "examine the books" suggests that the Rothschilds really did see some kind of constitutional control over public finances as desirable, if only as a means of reassuring British investors.[36]

Admittedly, Rother managed to get rid of Nathan's stipulation that the sinking fund take the form of purchases of £150,000 of British consols; nor was anything more heard about the independent committee to administer it. The only allusion to the Prussian estates came in clause 5 of the final contract, which merely stated that "for the security of the creditors" there would be a special mortgage on the royal domains "which are wholly disposable according to the House[hold] Law of November 6, 1809, passed by H.M. the King of Prussia and the princes of the royal house with the assent of the provincial estates."[37] The estates were not mentioned at all on the bonds as issued. Nevertheless, Nathan's early insistence on some kind of political guarantee had important political ramifications. There is at least an indirect link from Nathan's negotiations with Rother to the subsequent clause 2 of the "Decree for the Future Management of the State Debt" of January 17, 1819, which imposed a ceiling on the state debt, earmarked revenues from the royal domains to service it, and explicitly declared: "If the state should in future for its

maintenance or for the advancement of the common good require to issue a new loan, this can only be done *in consultation with and with the guarantee of the future imperial estates assembly.*"[38] Drafted by Rother himself, this indenture provision meant that any future loan by the Prussian state would automatically lead to the summoning of the estates; in other words, it conceded a link between any future public borrowing and constitutional reform. Only by raising loans indirectly through the notionally independent Seehandlung could the Prussian state henceforth borrow money without summoning the estates. This explains why, of all the German states, Prussia borrowed the least in the 1820s and 1830s—and why, when the policy of retrenchment finally broke down in the 1840s, the consequences were truly revolutionary.

To the social historian's eyes, the most astonishing thing about the Prussian loan negotiations is not the substance but the tone of the Rothschilds' dealings with the Prussian government. Salomon evidently relished the desperation of Prince Hardenberg when the two met in Koblenz: "As I see it, they must or will say yes. I wanted to leave and threatened the Prince and Rother, saying that I could not sit down, and put a gun to their heads, saying 'You must say yes or no.' The old, honorable, brave Prince prayed to me as if to God, pleading that I should put him out of his embarrassment and go with Rother to Berlin [to explain the position to the king]."[39] When Rother attempted to modify the terms after the contract had been signed, he was treated to a broadside from Nathan that could scarcely have been less respectful of Hohenzollern absolutism:

> Dearest friend, I have now done my duty by God, your King and the Finance Minister von Rother, my money has all gone to you in Berlin . . . now it is your turn and duty to yours, to keep your word and not to come up with new things, and everything must remain as it was agreed between men like us, and that is what I expected, as you can see from my deliveries of money. The cabal there can do nothing against N. M. Rothschild, he has the money, the strength and the power, the cabal has only impotence and the King of Prussia, my Prince Hardenberg and Minister Rother should be well pleased and thank Rothschild, who is sending you so much money [and] raising Prussia's credit.[40]

That a Jew born in the Frankfurt ghetto could write in these terms to a Prussian official speaks volumes for the social revolution the Rothschilds were bringing about among the European elites.[41]

To the historian of finance, however, the 1818 Prussian loan stands out for very different reasons. In Nathan's eyes the demand for some kind of political security was probably the least important of the conditions he considered attaching to the loan, which was why he did not insist on it. More important was the fact that, unlike the loans of 1817, this loan was to be denominated not in thaler but in sterling, with the interest payable not in Berlin but in London. In addition, as we have seen, there was to be a British-style sinking fund to ensure the amortization of the loan.[42] This deliberate Anglicization of a foreign loan was a new development. The French loans floated by the Rothschilds' rivals to fund postwar reparations had been denominated in francs, and interest had been payable in Paris, with attendant inconvenience and exchange rate risks for British investors. By contrast, investors in the Prussian loan could expect the returns to be paid in sterling through the Rothschild offices in New Court, St. Swithin's Lane, which made the bonds a great deal more attractive to British investors than if they had been denominated in thalers with interest collectable in distant Berlin. (Though the Rothschilds could, in theory, have

arranged for thaler payments to be remitted to London via their Frankfurt branch, they would legitimately have charged a commission for such a service.) Moreover, the Rothschilds' Europe-wide network of brokers, agents, private investors, and associated banks meant that they could market the sterling bonds not only in London but also in Paris and Vienna, to say nothing of Berlin itself, Hamburg, and Frankfurt.[43] This network extended well beyond the financial world into the exalted realm of Europe's political elites. In 1818, for example, the Frankfurt Rothschilds granted subscriptions to the new Prussian loan not only to other Frankfurt bankers like Bethmann and Gontard, but also to their old sleeping partner in Frankfurt, Karl Buderus, the Austrian representative at the Bundestag, Count Buol, and a number of other members of the diplomatic corps.[44] In Paris, the political figures who were offered Prussian bonds included no less a political luminary than Charles Maurice de Talleyrand.[45]

Not surprisingly, with buyers like these, the loan was a success. The bonds rose initially to 85 (i.e., 15 percent below par), then slipped back to 82 in May 1818 and 73.5 in late 1819 before rising steadily again. Rumors of a new loan in 1820 seem to have prompted the Rothschilds themselves to sell off their own holdings, but these proved unfounded.[46] In fact, the bonds reached par in 1824. The Rothschilds' only cause for complaint was that they had underestimated how much the success of the flotation would weaken sterling relative to the thaler and other continental currencies, thus reducing the thaler value of the interest payments the Prussians had to make—an unforeseen risk of early eurobond issuance.[47] For their part, Humboldt and Rother were understandably impressed. Nathan, Humboldt reported to Hardenberg, was not only "the most enterprising businessman here," he was also "dependable . . . fair, very upright and understanding" in his dealings with governments. Rother went further: "The Rothschild in this country . . . has an incredible influence upon all financial affairs here in London. It is widely stated, and is, indeed, close to the truth, that he entirely regulates the rate of exchange in the City. His power as a banker is enormous." With his reputation in Berlin firmly established, Nathan was able to secure an additional Prussian loan (to the Seehandlung) for £3.5 million in 1822.[48]

The 1818 Prussian loan thus represented a major step toward both the integration of the international bond market and the creation of London as the preeminent international financial market. In stipulating his conditions, Nathan not only made the Prussian loan attractive to British and continental investors, he also established a model for future international bond issues. The innovation swiftly spread, and before long the overwhelming majority of sovereign borrowers seeking to tap British savings did so by issuing sterling-denominated bonds that paid interest in London. *The Times* did not exaggerate when it later described Nathan as "the first introducer of foreign loans into Britain":

> [F]or, though such securities did at all times circulate here, the payment of dividends abroad, which was the universal practice before his time, made them too inconvenient an investment for the great majority of persons of property to deal with. He not only formed arrangements for the payment of dividends on his foreign loan in London, but made them still more attractive by fixing the rate in sterling money, and doing away with all the effects of fluctuation in exchanges.[49]

The coup that completed the Rothschilds' emergence as "bankers to the Holy Alliance" came in 1822, with the loan to Russia. Despite having allowed the Rothschilds to handle the transfer of much of its wartime subsidy payments and subsequent reparations

№ 79948 | № 25263 | 79

ROUBLES 960 | 1822 года. | £148 Sterling

328

НЕПРЕРЫВНЫЙ ДОХОДЪ ПО 5 НА СТО.

Свидѣтельство о непрерывномъ доходѣ на капиталъ, внесенный въ Государственную долговую книгу Коммиссіи погашенія долговъ, состоящій въ *девяти стахъ шестидесяти рубляхъ серебромъ*, равняющихся 148 фунтамъ стерлинговъ.

Записанный 1го Марта 1822.

Книга 2. стран. 479. 2 займа Лит. А.

Непрерывный доходъ 48 руб. сереб. или 7 фун. ст. 8 шил.

Капиталъ 960 рублей серебромъ равняющійся 148 фун. стерл.

Предъявитель сего Свидѣтельства имѣетъ право на непрерывный доходъ, заключающійся въ *сорока восьми рубляхъ серебромъ*, платимый чрезъ каждые полгода по его произволу въ *С. Петербургѣ* или *Лондонѣ*, а именно *двадцать четыре рубля серебромъ* 1го числа Марта и *двадцать четыре рубля серебромъ* 1го числа Сентября; естьли въ *С. Петербургѣ*, то серебряными рублями настоящаго вѣса и пробы, естьли же въ *Лондонѣ*, то по *трехпилингамъ* и *одинъ пенсъ стерлингъ* за каждый серебряный рубль: въ томъ и другомъ случаѣ по предъявленіи купона на причитающійся къ платежу непрерывный доходъ. Предъявитель сего Свидѣтельства можетъ, представивъ оное въ Государственную Коммиссію погашенія долговъ, требовать, чтобы вмѣсто онаго выданъ былъ безсрочный билетъ на туже сумму на его имя, или на имя лица, или лицъ, которыя онъ назначитъ: въ такомъ случаѣ непрерывный доходъ имѣетъ быть платимъ токмо въ *С. Петербургѣ* въ вышепостановленные сроки, и трансфертъ или передача таковыхъ билетовъ должна быть производима по существующимъ правиламъ.

Двадцать четыре купона принадлежатъ къ сему Свидѣтельству. Естьли при наступленіи срока послѣднему изъ нихъ, капиталъ не будетъ выкупленъ, или обращенъ въ безсрочный билетъ Коммиссіи погашенія долговъ; то имѣютъ быть выданы вновь двадцать четыре купона, и такъ далѣе, дабы обезпечить предъявителю полученіе непрерывнаго дохода въ *С. Петербургѣ* или *Лондонѣ*.

Прим. Особенный фондъ, или капиталъ, составляющій (ежегодно) *одинъ* процентъ со всей суммы сего займа, назначенъ на выкупъ его.

Выписка изъ Устава Коммиссіи:

§. 22. Безсрочный непрерывный доходъ, равно какъ и платежъ срочныхъ долговъ [illegible] въ мирное и военное время безъ всякаго различія, къ дружественной ли или не[illegible] принадлежитъ вкладчикъ.

§. 23. Въ случаѣ смерти иностраннаго вкладчика безъ завѣщанія, безсрочный долгъ имѣетъ принадлежать его наслѣдникамъ по порядку и правамъ наслѣдія той націи, къ которой онъ принадлежалъ.

§. 24. Капиталы, въ безсрочный долгъ обращенные, составляя ненарушимую собственность вкладчика, не подвергаются секвестру ни по казеннымъ, ни по частнымъ искамъ; изключая, естьли весь или часть капитала представлена въ залогъ по подрядамъ, или другимъ сдѣлкамъ съ казною или частными людьми, или въ обезпеченіе иска; въ такомъ случаѣ оный подлежитъ общимъ правиламъ о залогахъ и взысканіяхъ. Равнымъ образомъ таковые капиталы ни въ какомъ случаѣ не подлежатъ никакимъ налогамъ.

§. 25. Никто не можетъ быть противъ его желанія принужденъ къ обратному полученію всего или части капитала, въ безсрочномъ долгѣ помѣщеннаго. Но дабы съ другой стороны предоставить каждому болѣе удобности обратить оный, когда пожелаетъ, въ наличныя деньги, Коммиссія имѣетъ употреблять на выкупъ оныхъ по курсу особенный капиталъ погашенія, ежегодно сверхъ платежа непрерывныхъ доходовъ на предметъ сей назначаемый.

За Управляющаго С. Ланиковъ

Бухгалтеръ [illegible]

ТАЛОНЪ

8-е двѣнадцатилѣтіе.

къ свидѣтельству 2-го 5% Россійскаго займа 1822 г. лит. А, № 25263, на капиталъ 148 ф. стерл.

Съ 1/14 Марта 1918 г., по предъявленіи сего талона, будетъ выданъ въ С. Петербургѣ изъ Государственной Коммиссіи Погашенія Долговъ новый купонный листъ на дальнѣйшія двѣнадцать лѣтъ, съ 1/14 Марта 1918 г. по 1/14 Марта 1930 г.

Послѣ 1/14 Сентября 1919 г. талонъ сей недѣйствителенъ, и новый купонный листъ будетъ выданъ лишь по предъявленіи самаго свидѣтельства.

Управляющій Государственною Коммиссіею Погашенія Долговъ [illegible]

contributions, Russia initially turned to others for assistance with fiscal stabilization; it was Barings and Reid Irving who handled the 1820 Russian loan, for example.[50] This, however, was no great disappointment to the Rothschilds, as the Russians still refused to follow the Prussian example of issuing bonds denominated in sterling and with interest payable in London, insisting that it was a matter of "principle" to "negotiate only in Russian currency."[51] Two years later the Russians, like the Prussians before them, came around. In the summer of 1822, a loan of £6.6 million was issued in 5 percent bonds priced at 77. It proved to be as big a success as the Prussian bonds of 1818. Nathan had no difficulty in selling these new sterling bonds at prices of 80 (20 percent below par) to his network of London brokers, led by his brother-in-law Moses Montefiore.[52] In addition, substantial parcels of the loan went to major continental bankers like David Parish and Arstein & Eskeles in Vienna[53] and the presiding genius of the Restoration era, the Austrian Chancellor Prince Metternich.[54]

In some ways the two transactions were similar. In both cases, there was a British-style sinking fund to reassure investors that the loan would be redeemed as specified. There were, however, three important differences between the Prussian and Russian loans. The Russian bonds were—unlike the Prussians—*rentes* in the French style; that is, they would notionally pay the prescribed annuity forever. Second, the Russian bonds had a war clause that stated: "The payment of the perpetual Annuity, as well as the payment of the outstanding Debts, will be effected in time of Peace, as well as time of War, without distinction, whether the creditor belongs to a friendly or a hostile nation." This reflected the Rothschilds' growing awareness that any kind of war was likely to raise the likelihood of a default by tipping a combatant power's finances back into the red; the clause was intended to reassure investors that the commitments made to them would be honored whatever the political situation.[55] The third, and in this context most important, difference suggests that a compromise had been struck between Rothschild business acumen and Russian national pride. The Russian bonds were denominated in both Russian roubles *and* pounds sterling and gave bearers the option to receive their interest in *either* St Petersburg or London. Interestingly, the exchange rate between the two currencies was specified (as "*three shillings* and *one penny* sterling per Silver Rouble"), so that there was no way that investors could use the securities for a foreign exchange speculation or hedge.[56] Now, for the first time, an investor could choose where he preferred to collect his interest. A Russian could demand roubles in St. Petersburg; an English investor, pounds in London.

In his book *On the Traffic in State Bonds*, the German legal expert Johann Heinrich Bender singled this out as one of the Rothschilds' most important financial innovations: "Any owner of government bonds . . . can collect the interest at his convenience in several different places without any effort."[57] Bender's work was later cited by Werner Sombart as evidence that "not only in quantitative terms but also in qualitative terms, the modern stock exchange is Rothschildian."[58] Why, one may ask, did this provision seem so important to contemporaries? The best answer may be that it summed up the new and unprecedented mobility of capital that the Rothschilds seemed to personify. In a brilliantly

Opposite: *Russian Perpetual Bond issued by Nathan Rothschild. March 1, 1822.* Annuity for forty-eight silver roubles, payable biannually either in St. Petersburg or in London at a rate of three shillings and one penny per rouble. The back of the bond reads that "the payment of the Annuity . . . will be effected in time of Peace as well as in time of War, without distinction, whether the creditor belongs to a friendly or hostile nation." The bond is personally signed by Nathan Rothschild as "contractor."

insightful essay published in 1838, Heinrich Heine described a conversation with James Rothschild in the streets of Paris in which Rothschild supposedly said to him:

> To the foundation of each new order of things there belongs a convergence of influential people, who jointly concern themselves with these new things. In the past, such men used to live from the rents of their estates or their offices and were therefore never entirely free, but were always chained to a distant landed estate or some local administrative center. But now the system of paper securities frees these men to choose whatever place of residence they like; they can live anywhere, without working, from the interest on their bonds, their portable property, and so they gather together and constitute the true power of our capital cities. And we have long known what it portends when the most diverse energies can live side by side, when there is such centralization of the intellectual and of social authority.

Heine agreed, but went further. In his eyes, Rothschild, as a financial innovator, could now be mentioned in the same breath as Richelieu and Robespierre as one of the "three terroristic names that spell the gradual annihilation of the old aristocracy." Richelieu had destroyed the sovereignty of the nobility by reducing the aristocracy to mere courtiers or bucolic irrelevances. Robespierre had decapitated this decadent elite, but a new aristocracy had risen up among the post-revolutionary landowners. "Then came Rothschild and destroyed the supremacy of the earth by raising up the system of government bonds to supreme power . . . endowing money with the former privileges of land. To be sure, he has thereby created a new aristocracy, but this is based on the most unreliable of elements, on money . . . [which] is more fluid than water and less steady than the air."[59]

To many commentators, the primary significance of the Rothschild loans of 1818 and 1822 was indeed political. Far from being "revolutionaries," as Heine mischievously suggested, the Rothschilds could justifiably be regarded as bankers to the Holy Alliance, "la haute Trésorerie de la Sainte Alliance."[60] Indeed, when the itinerant German prince Pückler-Muskau first described Nathan in a letter to his wife, he introduced him as "the chief ally of the Holy Alliance."[61] Financially, there is no question that the Rothschilds gave the Alliance substance. When the Austrian emperor remarked to his envoy in Frankfurt that Amschel was "richer than I am," he was not being wholly facetious.[62] *The Times*'s correspondent reported from St. Petersburg that the mere appearance of James Rothschild at the bourse was expected to boost Russian bond prices.[63] Without the financial support that the Rothschilds could provide, it would doubtless have been harder to make the Austrian strategy of "policing" Europe effective in the 1820s. Political critics recognized the Rothschilds' importance in this regard. Nathan was caricatured as the "Hollow Alliance's" insurance broker, helping to prevent political fire in Europe.[64] In 1821 he even received a death threat because of "his connexion with foreign powers, and particularly the assistance rendered to Austria, on account of the designs of that government against the liberties of Europe."[65]

However, the Rothschilds' contemporary image as "bankers to the Holy Alliance" understated what might be called their political agnosticism—their tendency to assess business opportunities in financial rather than political terms. The attraction of counterrevolution was not that it restored despots but that it generated new financial needs. Nor were conservative regimes given preferential treatment. As the negotiations for the 1818 Prussian loan show, the Rothschilds—particularly Nathan and James—saw constitutional structures that controlled government finance as preferable to the extrava-

gance and inefficiency that often characterized absolutist regimes. More important, as Heine understood, the Rothschilds' innovativeness as financiers fundamentally ran counter to the Metternichian project of a grand restoration of the European social order. The success of the Prussian and Russian loans, along with many similar transactions for other European states, established the Rothschilds not only as the dominant force in European financial markets, but also as the richest men in Europe. In terms of capital, they now dwarfed their nearest rivals, the Barings. Not surprisingly, they soon acquired a reputation for political as well as financial power. As early as August 1820 the Bremen delegate to the German Confederation's Diet in Frankfurt had a conversation with his Austrian counterpart Count Buol in which they discussed the possibility that the Rothschilds now had real leverage over the statesmen of the Holy Alliance:

> This house has, through its enormous financial transaction and its banking and credit connections, actually achieved the position of a real Power; it has to such an extent acquired control of the general money market that it is in a position either to hinder or to promote, as it feels inclined, the movements and operations of potentates, and even of the greatest European Powers. Austria needs the Rothschilds' help for her present demonstration against Naples, and Prussia would long ago have been finished with her constitution if the House of Rothschild had not made it possible for her to postpone the evil day.[66]

The Frankfurt banker Simon Moritz Bethmann echoed this judgment in a letter written at around the same time: "N. M. Rothschild . . . constitutes the centrifugal point around which the stock exchange revolves. He alone determines the exchange, buying and selling £100,000 each day. . . . I can well understand why the Rothschilds are such useful instruments for the [Austrian] government."[67] All three men had their reasons for disliking this phenomenon, but they did not greatly exaggerate it.

In the final analysis, however, the significance of the loans of 1818 and 1822 was as much financial as it was political or social. In essence, they had created two templates that governments seeking to attract foreign capital could easily copy. For a government with no significant domestic market, there was the Prussian option of a sterling bond issued in London with interest payable in London. For governments wishing to tap both domestic and foreign savings, there was the Russian option of a bond issued in dual currencies with interest payable in dual markets. It would be an understatement to say that these two models caught on. The ensuing bubble in Latin American bonds in the early 1820s owed much to the phenomenally rapid spread of the Rothschild model.[68] Even that bubble's disastrous deflation could not kill off what would prove to be a century-long love affair between British investors and these eurobonds *avant la lettre*—a love affair without which the imperial *pax britannica* would have lacked the financial foundations that made it so extensive and enduring.

It was only the intrusion of three decades of exchange controls and other war-induced measures designed to insulate national capital markets from one another that led people—though certainly not Siegmund Warburg—to forget how long a prehistory this crucial financial instrument actually had. A form of eurobond had existed in eighteenth-century Amsterdam, only to be effaced by the upheaval of the Napoleonic Wars. The Rothschilds then revived, improved, and universalized this form in the years after Waterloo. What happened after the upheavals of the mid-twentieth century was not, therefore, the birth of the eurobond, but its second reincarnation.

19

German Debt in the Twentieth Century

TIMOTHY W. GUINNANE

Germany, more than any other country, experienced the turbulence of the twentieth century.[1] That turbulence is reflected in its economic and financial history. The German economy twice experienced the ruin of total war, then the painful process of reconstruction and reestablishing trade and financial ties with old economic partners. Germany also underwent an event rare even among countries with that much experience of war: divided into two countries by the victorious Allies in 1949, Germany reunited in 1990. The "united Germany" of today is not as large as the German Empire that entered World War I in 1914, but it is once again the largest country entirely in Europe, and easily the largest and most important of the European economies.

Germany's twentieth-century history has been told in many ways and from many perspectives. One way to view that history is through the lens of its debts, specifically its international debts. Germany's financial obligations to creditors, both governments and private firms and individuals, plays a role in the most famous (and infamous) episodes in the twentieth century. This chapter reviews some of Germany's major financial obligations in the twentieth century.

The story falls into four parts, first being the reparations from World War I. These were structured as a debt, although of an unusual kind. Second are the debts Germany incurred between the two world wars. This part in-

volves the Nazi treatment of the outstanding debt, which was in some cases a straight default, in others a "transfer stop." Third come the debts to Western governments incurred as part of the effort to provide relief and reconstruction assistance after World War II. The story concludes with the reestablishment of Germany's access to international capital markets as codified in the London Debt Agreement of 1953.

The Treaty of Versailles and Reparations

The countries that fought World War I all had trouble financing their enormous military expenditure with taxation alone. Each resorted to inflation and extensive borrowing, although in varying proportions. At the end of the war, all belligerents suffered the effects of inflation, which had often been partially disguised by rationing schemes, and the need to service the enormous government debt built up during the war. France and Belgium, the scene of most fighting on the western front, had experienced great material damage to farms, factories, and other property. Countries that had raised large armies also committed to pensions for soldiers and their widows and orphans, meaning new financial obligations in the future. In addition, national and international economic life had been disrupted during and just after the war. The first two years of peace saw the near-collapse of the European economy.

This was the financial background to the reparation obligations placed on Germany by the Treaty of Versailles in 1919. Germany had not been subjected to any physical destruction during the war, but otherwise faced the same problems as other belligerents. But the Germans also faced a unique burden. The Allies had been able to finance much of their military expenditure with loans from the United States. Some of the U.S. lending was intermediated through the United Kingdom and France, which borrowed from the United States and re-lent to other Allies. Germany's war debts were different. The other Central powers were poorer than Germany, leaving the Reich to play the role of financier. So most of its war debt was internal, that is, owed to German citizens.

At the conclusion of most European wars before World War I, the defeated country had been forced to pay the victor. France, for example, had paid significant reparations at the end of both the Napoleonic Wars and the Franco-Prussian War. During World War I, the civilian populations of the belligerent states had endured severe hardships due to inflation, increased taxation, and shortages of food and consumer goods. Governments on both sides justified the privations by assuring their citizens that after the war, the other side would pay back the financial costs. Thus it was no shock when the Allies stated, in Article 231 of the Treaty of Versailles, that Germany would accept financial responsibility for the war. The Allies did not demand immediate payment in full: the reparations obligations were treated as another debt placed on Germany.

The reparations obligations were controversial at the time, and today are widely viewed as both mean-spirited and short-sighted. The subject remains one of serious debate, but many observers unfortunately conflate two issues. The defeated party in European wars had usually paid reparations to the victors; Germany was not, therefore, being singled out for unprecedented treatment. And the famous "War guilt" clause, Article 231 of the Versailles treaty, was intended as a justification for the reparations demands that follow in that part of the Treaty:

> The Allied and Associated Governments affirm and Germany accepts the responsibility of Germany and her allies for causing all the loss and damage to

which the Allied and Associated Governments and their nationals have been subjected as a consequence of the war imposed upon them by the aggression of Germany and her allies.

The much broader moral and political sense attached to the "responsibility" asserted here may well be unfair, but the politicization of Article 231 and subsequent discussion of it have ignored its place in the rhetoric of the treaty.

Opposition to the reparations provisions of the treaty has taken several forms, most of them spelled out at the time by John Maynard Keynes in his famous polemics. In one of the great ironies of modern historiography, many students learn of the German reparations problem from Keynes's pen, as if he were a dispassionate observer, which he most decidedly was not. He was an advisor to the British delegation at the Peace conference and when his views were not accepted, he used his formidable connections and literary talents to oppose the Treaty in general and the reparations provisions in particular. Taking his views of the reparations as given is like constructing a history of the U.S. civil war from the speeches of Abraham Lincoln. More ironic is the preference for his angry, impassioned *Economic Consequences of the Peace*; few know the more careful and thoughtful subsequent work, *A Revision of the Treaty*.[2] Keynes had his critics during the 1920s debate itself. Most of the valid points against him were summarized later in Mantoux's *The Carthaginian Peace or the Economic Consequences of Mr. Keynes*.[3] Today most economic historians think Keynes made some valid criticisms but pushed them much too far. One trenchant analyst has recently summarized the case against the importance of the German reparations, emphasizing that in the end the Germans did not really pay anything.[4]

The first line of attack on reparations has argued that reparations were inconsistent with the spirit of U.S. President Woodrow Wilson's Fourteen Points, which had formed the basis for the Armistice agreement. Wilson's pronouncements spoke of restoring occupied areas; the reparations as written into the Treaty went far beyond that. A second line of opposition turns on the nature of German constitutional arrangements after the War. During the war many factions in Allied countries had blamed the war on Prussian militarism and on the undemocratic nature of the German Reich. After the war the Kaiser abdicated and fled. The new Weimar constitution elaborated a parliamentary democracy with clear lines of ministerial responsibility leading to elected representatives. The government and constitutional order that had started and prolonged the war, in other words, was gone, and by forcing the Weimar Republic to shoulder the obligation of war reparations the Allies were at best saddling it with a debt it never incurred, and at worst punishing the German people rather than their government.

These two arguments would apply to any form of reparations, no matter how small and symbolic. Many critics, such as Keynes, also attacked the reparations demands on more specific grounds. First, the Treaty did not name a specific monetary figure that Germany had to pay. Rather, the Treaty created a Reparations Commission that would assess both the Allied war costs and the German economic ability to make payments. But the Treaty was silent on even the most general criteria for defining this ability. Also, when the Reparations Commission began its work it became clear that the amounts they contemplated were enormous and included items that had not previously been considered a cost of war.

Many discussions of the reparations miss an essential point. The first bill presented to Germany by the London Schedule of Payments (1921), was for 132 billion (gold) marks. Of that, however, the German government was to begin service on two series of bonds (the so-called A and B bonds) totaling 50 billion marks. The Reparations Commission

was empowered to issue C bonds for part of the rest of that 132 billion marks, but the Germans would have to service these bonds only if the Commission concluded that the German economy was able to bear this further burden. The C bonds had some political significance but no serious observer ever expected them to be issued or serviced. Belgium's premier noted that such bonds could be put away "without bothering to lock up, for no thief would be tempted to steal them."[5]

In some respects the reparations obligations were just like any other international debt; the German government had to raise funds via taxation and transfer those funds to creditors abroad. What made this debt unusual, however, was not just that Germany did not know whether she would have to service the C bonds; she also had good reason to think she might avoid full payment on the A and B bonds. The United States was clearly interested in reparations only to recover its own loans to Britain and France. Britain, although a signatory to the Versailles treaty, quickly lost its ardor for reparations, and by 1922 only France and Belgium (the two countries with the greatest material damage) were adamant about these funds.

Given Keynes's influential writings on the topic it is worth stressing the disconnect between his claims and actual history. First, he claimed that the demands were much larger than what the Germans could afford, and that in making these extravagant demands the Treaty risked either starving the German people or grinding the European economy into the ground. This simply did not happen, as the Germans never even fully paid the A and B bonds. Any putative damage to the German (and world) economy caused by the reparations obligations must stem from the uncertainty about the total amount, or from the secondary impact on the German economy or political scene. The actual payments made were insignificant.

Keynes made a second claim, which is of some interest in economics but again has no direct relation to the history in question. Service on the A and B bonds was set at 2 billion gold marks per year plus 26 percent of the value of Germany's exports. Thus the original demands were scaled to some estimate of Germany's ability to pay, or at least to make transfers. The two later reparations-related loan schemes, the Dawes (1924) and Young (1929) plans, each reduced this sum considerably. Keynes worried about the transfer problem, which is to say, how Germany could convert the marks it raised in taxes into the francs and sterling necessary to make the reparations payments. The only way to obtain the foreign currencies was to run export surpluses, which risked causing unemployment in the countries it was repaying. Much ink was also spilled over the so-called secondary burden, that is, the possibility that in trying to increase exports Germany would adversely affect its terms of trade and thus increase its total cost in reparations.

The transfer problem has unfortunately dominated much economic writing on the reparations question. Germany's transfer capacity also figured heavily in the arguments made concerning the post–World War II debt settlement. As some writers have insisted, the problem is bogus; Germany could have made its reparations claims to France, for example, by simply transferring to the French title to German productive assets. This approach was politically implausible, yet its technical feasibility shows the importance of the transfer issue in framing the debates over reparations.

Interwar Debt

Reparations payments were hindered by several problems, including difficulties reforming the German tax system, political turmoil in Germany, and repeated attempts by the Ger-

man government to evade payment. A series of fulfillment crises culminated in the Franco-Belgian occupation of the Ruhr in 1923–24, which attempted to force the German government's hand. Instead, the Germans initiated a policy of passive resistance, supporting Ruhr workers on general strike. The additional costs helped turn already ruinous German inflation levels into hyperinflation.

To stabilize the German economy and work out a compromise on the reparations question, the Allies established the Dawes committee, named for Charles G. Dawes, onetime director of the U.S. Bureau of the Budget. The committee proposed a new approach in April, 1924. The Dawes Plan would raise an international loan of about 800 million marks to stabilize the German economy, and at the same time reschedule reparations payments to considerably reduce the immediate burden. The Dawes Plan also placed the Reichsbank (the central bank) under international supervision. During the hyperinflation the Reichsbank had printed money willy-nilly, partly in response to political pressure. Strengthening its independence from the government was intended to reassure lenders there would not be a second hyperinflation. This reassurance was viewed as critical to generating the additional private lending the German economy needed. An important innovation in the Dawes Plan was its separation of payment from transfer. The new system required that the German government raise tax revenue to pay for reparations, but placed decisions about transfer in the hands of an Allied agent.

The Dawes loan, like the later Young loan, was issued in relatively small denominations in several tranches. Investors could purchase the bond in U.S. dollars, sterling, Swiss francs, and so forth, and receive their payments in those currencies. This made the bond more marketable to small investors, who would be less likely to purchase a bond that entailed foreign-exchange transactions. The U.S. tranche of the Dawes loan included a feature that became a serious issue after the war: a gold clause. If a loan contained a gold clause, the borrower was contracting to repay a number of dollars equivalent to a specific gold value at the time of the loan. At the time of the Dawes loan, a dollar was equal to one-twentieth of an ounce of gold. A bond for $1000 was thus worth 50 ounces of gold.

The Dawes plan at first worked better than anticipated, in part because of a flood of international lending, primarily from the United States, spurred by the apparent solution of the reparations problem. But by 1928 the agent supervising reparations payments on behalf of the Allies, Parker Gilbert, worried that the German government was becoming fiscally irresponsible again. These concerns led to another conference in 1929 under the chairmanship of Owen Young, an American lawyer and businessman who had advised the Dawes committee. The resulting Young Plan, which was intended to be final, involved another loan (this time of 1.2 billion marks) and a short-term reduction in reparations payments. Unlike earlier plans the Young Plan fixed a definite, unconditional sum Germany would have to pay.

The Young loan of 1930, like the Dawes loan, was issued in several tranches, all representing major currencies. Unlike the Dawes loan, all tranches of the Young loan had gold clauses—the German government was agreeing to pay currency equivalent in value to the gold content of a Swiss franc in 1930, a U.S. dollar in 1930, and so on. These gold clauses were only pragmatic, because with the onset of the Depression there was already discussion of several countries leaving the gold standard. Britain, in fact, did leave the gold standard in 1931. The Young loan also played a notable part in the formation of the Bank for International Settlements in Basel, Switzerland. That bank has since played several international roles, such as facilitating "clearing" between central banks and international

INTERNATIONALE 5½%IGE ANLEIHE DES DEUTSCHEN REICHS 1930

GERMAN GOVERNMENT INTERNATIONAL 5½ PER CENT. LOAN, 1930

EMPRUNT INTERNATIONAL 5½ P. C. 1930 DU GOUVERNEMENT ALLEMAND

№ A. 22399 — № A. 22399

Diese Anleihe wurde in Ausführung des Neuen Plans, der durch das am 20. Januar 1930 unterzeichnete Haager Abkommen zwischen Deutschland und den Gläubigermächten angenommen wurde, aufgelegt in Deutschland, den Vereinigten Staaten von Amerika, in Belgien, Frankreich, Groß-Britannien, Holland, Italien, Schweden und der Schweiz [illegible] verschiedener Ausgaben, deren Beträge zu [illegible] ausmachen, [illegible] Gegenwärtige Gesamtbetrag von annähernd 300 000 000 $ U. S. A. entsprechen.

Die Bedingungen der Anleihe sind in einem „General Bond", einem Abkommen zwischen Deutschland und [illegible] der Bank für internationale Zahlungsausgleich, die Treuhänderin der Anleihe [illegible] und dessen Text auf der Rückseite wiedergegeben ist.

Belgische Ausgabe

SCHULDVERSCHREIBUNG

auf den Inhaber

über

100 (Hundert) Belgas oder

500 (Fünfhundert) Belgische Franken

oder 58,156863 Reichsmark, oder 13,904457 Golddollar U. S. A. oder 354,605574 Französische Francs, oder 2 17 1,714266 Pounds Sterling, oder 39,597766 Dutch Florins, oder 264,18487 Lire, oder 51,884328 Schwedische Kronen, oder 72,061567 Schweizer Franken.

Die vorliegende 5½ %ige Anleihe ist [illegible] einer Ausgabe von **175.000.000 Belgas oder 175.000.000 belgischen Franken** über 20 429 400 Reichsmark, oder 4 866 400 Golddollar U. S. A., oder 1 000 000 Pfund Sterling, oder 238 213 400 Französische Francs, oder 1 000 000 Pfund Sterling, oder 17 107 100 Dutch Florins, oder 92 464 700 Lire, oder 18 159 500 Schwedische Kronen, oder 25 221 500 Schweizer Franken, die den belgischen Teil der Gesamtanleihe von [illegible] bilden. Diese Ausgabe besteht aus:

50 265 Teilschuldverschreiben über 100 Belgas oder 500 Belgische Franken mit den Nummern A 1 bis einschließlich A 50 265,
12 645 Teilschuldverschreiben über 500 Belgas oder 2 500 Belgische Franken mit den Nummern B 1 bis einschließlich B 12 645,
23 651 Teilschuldverschreiben über 1 000 Belgas oder 5 000 Belgische Franken mit den Nummern C 1 bis einschließlich C 23 651.

Die Zinsen zum Satze von 5½ (fünfeinhalb) v. H. jährlich sind am 1. Juni und 1. Dezember eines jeden Jahres gegen Abtrennung der dieser Schuldverschreibung beigefügten Zinsscheine zahlbar.

Die Zahlung der Zinsscheine und die Einlösung der Schuldverschreibungen erfolgen in Brüssel in Belgas oder belgischen Franken, wobei die Belgas für Zwecke der gegenwärtigen Anleihe unter allen Umständen durch ein Feingoldgewicht bestimmt ist, [illegible] gesetzmäßig [illegible] Belgien.

Der Inhaber hat Anspruch auf den am Tage der Fälligkeit sich ergebenden Gegenwert des Goldwertes des Kapitalbetrages und der Zinsen in belgischem Gelde nach der Maßgabe daß in mindestens den auf der Schuldverschreibung und dem Zinsschein angegebenen Nennbetrag erhält.

Die Zahlung des Kapitalbetrages und der Zinsen, die sich nach den vorausgehenden Bestimmungen berechnen, wird auf Wunsch des Inhabers an jedem ausländischen Platz, an dem irgendeine Ausgabe der Anleihe notiert wird, zu dem am Tage der Zahlung geltenden Wechselkurse erfolgen.

Die Gesamtheit der Schuldverschreibungen dieser Anleihe muß bis zum 1. Juni 1965 zu pari eingelöst sein.

Die Deutsche Regierung verpflichtet sich, an die Bank für Internationalen Zahlungsausgleich, die Treuhänderin der Inhaber der Schuldverschreibungen, in der im „General Bond" vorgesehenen Form derjenige Summe zu zahlen, die nach den Bestimmungen des [illegible] „General Bond" zahlbar ist für die Zahlung der Zinsen und für die Tilgung nach dem Plan des kumulativen Tilgungsfonds zu verwenden ist, dieser ist so berechnet, daß die Zahlung der Zinsen der Schuldverschreibungen dieser Anleihe und ihre Einlösung zu pari am 1. Juni 1965 gesichert ist.

Der Teil des Tilgungsfonds, der sich auf die belgische Ausgabe bezieht, wird jährlich für die Einlösung der Schuldverschreibungen dieser Ausgabe verwendet, und zwar:

a) zum Ankauf von Schuldverschreibungen zu pari oder darunter zuzüglich der aufgelaufenen Zinsen, jedoch abzüglich aller Kosten,

b) soweit dieser Betrag nicht für den Ankauf von Schuldverschreibungen aufgebraucht ist, zur Einlösung zu pari.

Die Auslosungen finden in jedem Jahre, in dem sie notig sind, in den Formen und unter den Bedingungen statt, die durch die Bank für [illegible] und in Zahlungsausgleich nach Benehmung mit der Reichsschuldenverwaltungsbehörde werden. Die [illegible] werden jedoch [illegible] mindestens [illegible] vor dem für die Einlösung festgesetzten Zeitpunkt [illegible].

Die Gesamte Regierung behält sich das Recht vor, vom 1. Juni 1935 ab die noch im Umlauf befindlichen Schuldverschreibungen oder einen Teil derselben, der den Betrag von 30 000 000 $ U. S. A. oder eines Vielfachen dieser Summe darstellt, zum Tilgungsfonds der aufgelaufenen Zinsen hinzuzufügen, und zwar nach einer sechs Monate vorhergehenden Kündigung [illegible] Bekanntmachung [illegible] Einlösung mit dem Betrag, [illegible] Anleihe [illegible] Ausgaben, [illegible] Ausgabe [illegible] Zinsen [illegible] Einlösung [illegible] Ausgabe werden die einzulösenden Schuldverschreibungen durch Auslosung bestimmt.

Kapitalbetrag und Zinsen sind ohne Abzug irgendwelcher gegenwärtigen oder zukünftigen Steuern zahlbar.

[illegible] Schuldverschreibungen sind sowohl in Kriegs- als auch in Friedenszeiten zu zahlen ohne Rücksicht darauf, ob die Inhaber Angehörige eines dem Deutschen Reiche freundlich oder feindlich gesinnten Staates sind, in keinem Falle dürfen die genannten Schuldverschreibungen mit Beschlag belegt oder sequestriert werden.

Im Falle von Abweichungen zwischen den Texten ist der englische Text maßgebend.

Berlin, den 15. August 1930

Pursuant to the New Plan adopted by the Hague Agreement signed the 20th January, 1930, between Germany and the Creditor Powers, this Loan has been issued in Germany, the United States of America, Belgium, France, Great Britain, Holland, Italy, Sweden and Switzerland in Bonds of various issues for amounts sufficient to yield in the aggregate an effective sum equivalent to approximately 300 000 000 $ U. S. A.

The conditions of the Loan are laid down in a General Bond, the text of which is printed on the back, and which has been delivered by the German Government to the Bank for International Settlements acting as Trustee of the Loan.

Belgian Issue

BOND TO BEARER

for

100 (Hundred) Belgas or

500 (Five Hundred) Belgian Francs

or 58,156863 Reichsmarks, or 13,904457 Gold Dollars U. S. A., or 354,605574 French Francs, or 2 17 1,714266 Pounds Sterling, or 39,597766 Dutch Florins, or 264,18487 Lire, or 51,884328 Swedish Kronor, or 72,061567 Swiss Francs.

This Bond is one of an issue of ***175.000.000 Belgas or 175.000.000 Belgian Francs****, or 20 429 400 Reichsmarks, or 4 866 400 Gold Dollars U. S. A., or 1 000 000 Pounds Sterling, or 238 213 400 French Francs, or 1 000 000 Pounds Sterling, or 17 107 100 Dutch Florins, or 92 464 700 Lire, or 18 159 500 Swedish Kronor, or 25 221 500 Swiss Francs, forming the Belgian Issue of the Loan. This issue is represented by*

50 265 denominations of 100 Belgas or 500 Belgian Francs No A 1 to A 50 265
12 645 denominations of 500 Belgas or 2 500 Belgian Francs No B 1 to B 12 645
23 651 denominations of 1 000 Belgas or 5 000 Belgian Francs No C 1 to C 23 651

Interest at the rate of 5½ (five and a half) Per Cent. per annum will be payable on the 1st June and the 1st December of each year, upon surrender of the coupons attached to this Bond.

The payment of the coupons and the redemption of the Bonds will be effected in Brussels, in Belgas or in Belgian Francs, the Belga being defined for the purpose of this Loan in all circumstances by the weight of fine gold determined by the laws now being in force (i. e. 0,209211 gr. for the Belga).

The Bondholder is entitled in Belgian currency to the equivalent at the due date of the gold value of the principal and the interest provided that he shall receive not less than the nominal amounts indicated on the Bond and on the coupon.

The payment of the principal and the interest calculated in accordance with the foregoing provisions, will be effected, at the holder, be made, at the then current rate of exchange, on any foreign market where any issue of the loan is quoted.

The total amount of the Bonds of this loan must have been redeemed at par on the 1st June, 1965.

The German Government has covenanted to pay to the Bank for International Settlements, the Trustee of the Bondholders, in the manner prescribed in the General Bond, the sum that is to be applied, according to the terms of the General Bond, annually to the payment of the interest and to the redemption in accordance with the plan of the cumulative Sinking Fund; this Fund is calculated in a way to secure the payment of the interest of the Bonds of this Loan and their redemption at par on the 1st June, 1965.

The part of the Sinking Fund relating to the Belgian issue will be used annually for the redemption of Bonds of this issue:

a) In purchasing Bonds at or below par plus accrued interest but exclusive of all expenses,

b) at par in drawings by lot to the extent to which purchases of Bonds are not effected.

The drawings will be made in respect of every year in which drawings will be necessary in the forms and conditions as the Bank for International Settlements will establish after the consultation with the Reichs Debt Administration. Bonds drawn by lot will cease to bear interest from the date fixed for their redemption.

Previous notice of six months being given, the German Government reserves the right, beginning on the 1st June, 1935, to redeem at par (plus accrued interest) the whole of the outstanding Bonds or portions thereof being the equivalent of 30 Millions of Dollars U.S.A. or multiples of that amount. In the case of a partial redemption the amount to be applied in such a redemption, will be distributed among the different issues of the Loan, proportionally to the number of obligations of each of the issues being in circulation at the time of this redemption. For each issue the Bonds to be redeemed will be designated by drawings.

Both principal and interest are payable without deduction for all present or future German taxes.

Both principal and interest of the Bonds will be paid in time of war as well as of peace and whether the holders are subjects of a state friendly or hostile to the German Reich, and in no case the said Bonds will be attached or sequestered.

In the event of any divergence between the texts the English text shall prevail.

Berlin, August 15, 1930

Tranche Belge

OBLIGATION AU PORTEUR

de

100 (Cent) Belgas ou

500 (Cinq Cents) Francs Belges

ou 58,156863 Reichsmarks, ou 13,904457 Dollars E. U. or, ou 354,895674 Francs Français, ou 2 17 1,714266 Livres Sterling, ou 39,597766 Florins P. B., ou 264,18487 Lire, ou 51,884328 Couronnes Suédoises, ou 72,061557 Francs Suisses.

La présente Obligation fait partie d'une Emission de ***175.000.000 de Belgas ou 175.000.000 de Francs Belges****, ou 20 429 400 Reichsmarks, ou 4 866 400 Dollars E. U. or, ou 1 000 000 de Livres Sterling, ou 238 213 400 Francs Français, ou 1 000 000 de Livres Sterling, ou 17 107 100 Florins P. B., ou 92 464 700 Lire, ou 18 159 500 Couronnes Suédoises, ou 25 221 500 Francs Suisses, constituant la Série Belge de l'Emprunt. Celle-ci est représentée par:*

50 265 coupures de 100 Belgas ou 500 Francs Belges, No A 1 à A 50 265
12 645 coupures de 500 Belgas ou 2 500 Francs Belges, No B 1 à B 12 645
23 651 coupures de 1 000 Belgas ou 5 000 Francs Belges, No C 1 à C 23 651

Les intérêts au taux de 5½ (cinq et demi) pour cent l'an, sont payables le 1er juin et le 1er décembre de chaque année, contre remise des coupons attachés au présent titre.

Le paiement des coupons et le remboursement des titres s'effectueront à Bruxelles, en Belgas ou Francs Belges. Le Belga étant défini aux fins du présent Emprunt, en toutes circonstances, par le poids d'or fin fixé par la législation en vigueur actuellement (soit 0,209211 gr. par Belga).

Le porteur a droit à l'équivalent en monnaie belge, au jour de l'échéance, de la valeur or du principal et de l'intérêt, étant entendu qu'il recevra au moins le montant nominal porté sur le titre et sur le coupon.

Le paiement du principal et de l'intérêt, calculés d'après les dispositions du précédent, sera effectué, à l'option du porteur, au cours du change du jour, sur toute place étrangère où une série quelconque de l'Emprunt sera cotée.

La totalité des Obligations du présent Emprunt doit être remboursée au pair pour le 1er juin 1965.

Le Gouvernement Allemand s'est engagé à verser à la Banque des Règlements Internationaux, Trustee des Obligataires, de la manière prévue au «General Bond», la somme qui, aux termes du dit «General Bond», doit annuellement être affectée au paiement de l'intérêt et à l'amortissement, suivant le tableau du fonds d'amortissement cumulatif, celui-ci a été calculé de manière à assurer le paiement des intérêts des Obligations du présent Emprunt et leur remboursement au pair, pour le 1er juin 1965.

La partie du fonds d'amortissement relative à la Série Belge sera affectée annuellement au remboursement d'Obligations de cette tranche:

a) par l'achat d'Obligations au pair ou au-dessous du pair, plus les intérêts courus mais à l'exclusion de tous frais;

b) au pair, par tirages au sort, dans la mesure du montant non absorbé par l'achat d'Obligations.

Les tirages s'effectueront chaque année où il y aura lieu d'en faire, dans les formes et conditions qui seront fixées par la Banque des Règlements Internationaux après avis de l'Administration de la Dette du Reich. Les Obligations sorties au tirage cesseront de porter intérêt à partir de la date fixée pour leur remboursement.

Le Gouvernement Allemand se réserve la faculté, moyennant un préavis de six mois, de rembourser au pair (plus l'intérêt couru), à partir du 1er juin 1935, la totalité des Obligations en circulation ou une partie d'entre elles représentant l'équivalente de 30 millions de Dollars E. U. ou des multiples de cette somme. En cas de remboursement partiel le montant y affecté sera réparti entre les différentes séries de l'Emprunt, proportionnellement au nombre d'Obligations de chacune des séries en circulation au moment de ce remboursement. Pour chaque série les Obligations à rembourser seront déterminées par voie de tirages.

Le principal et l'intérêt sont payables, sans déduction d'aucun impôt et taxe allemands présents et futurs.

Le principal et l'intérêt des Obligations seront payés aussi bien en temps de guerre qu'en temps de paix, que les porteurs soient ressortissants d'un Etat ami ou ennemi du Reich Allemand, et en aucun cas les dites Obligations ne pourront être saisies ou séquestrées.

En cas de divergence entre les textes, le texte anglais fera foi.

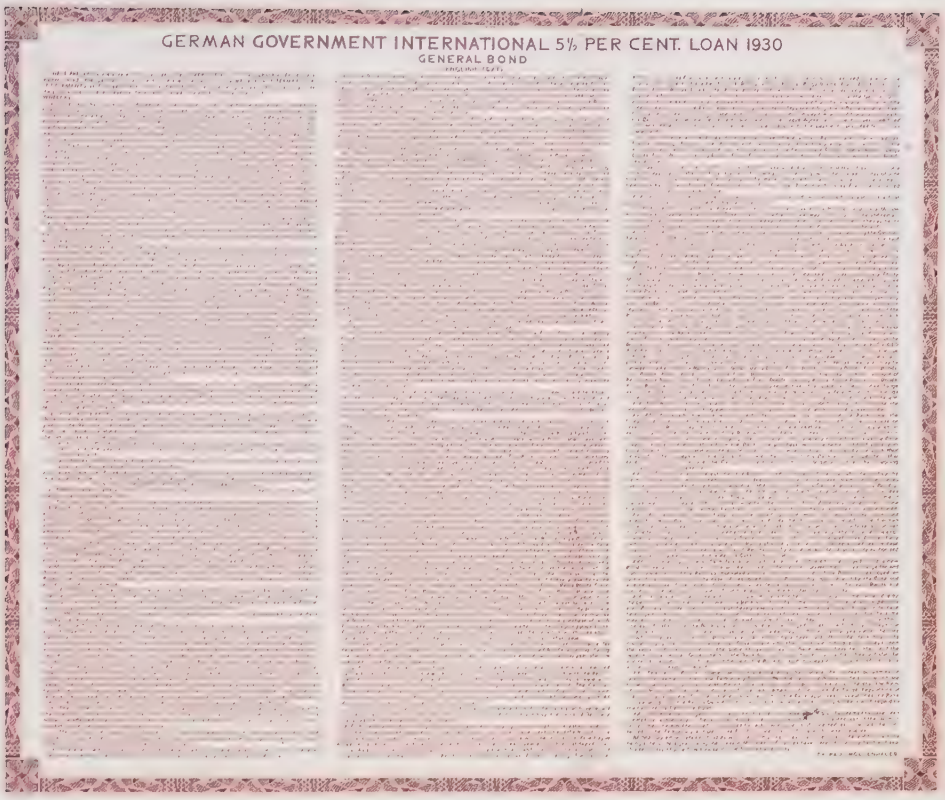
A Berlin, le 15 août 1930

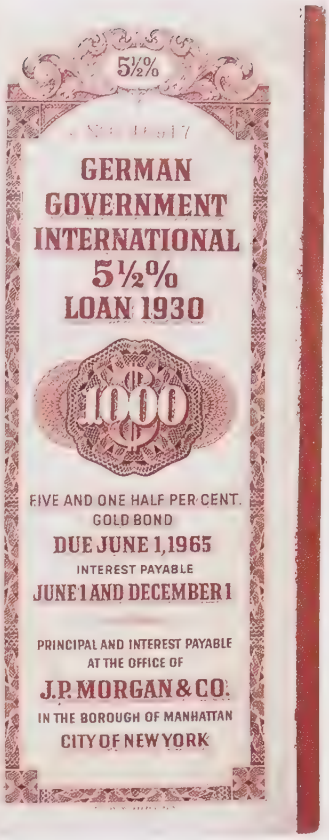
FÜR DAS DEUTSCHE REICH — FOR THE GERMAN REICH — POUR LE REICH ALLEMAND

MITGLIEDER DER REICHSSCHULDENVERWALTUNG
MEMBERS OF THE DEBT ADMINISTRATION OF THE REICH
MEMBRES DE L'ADMINISTRATION DE LA DETTE DU REICH

ZEGEL TE ZEGELEN 24 11 B

REICHSDRUCKEREI BERLIN





Opposite: *German government international 5.5 percent loan, 1930 General Bond. August 15, 1930.* Bond for 500 Belgian francs, part of the Belgian issue of the 5.5 percent Young Loan.

Above: *German government international 5.5 percent loan. June 1, 1930.* Bond for $1,000, part of the U.S. issue of the Young Loan. The back of the bond contains the conditions of the issue. Article XVI reads, "The principal and interest of the bonds will be paid in time of war as well as of peace and no matter of whether the holders of the Bonds are subjects of a state friendly or hostile to the German Reich."

financial institutions. But one of its original duties was to receive and make payments related to the Young loan.

The figures on this page illustrate the complications of a bond issue like the Young loan tranches. At left is a Belgian franc bond issued as part of the loan. The document above is part of the accompanying material for this bond. J. P. Morgan and other American investment banking houses heavily marketed these and other international securities. As the bond states, Morgan also provided payment; a U.S. purchaser could receive his interest payments at Morgan's offices or through one of Morgan's affiliate institutions. Note that the bond itself is printed in three languages, English, German, and French even though the bond is denominated in U.S. dollars. The languages were chosen for legal reasons and to enhance their marketability; some French speakers would prefer their investments be denominated in dollars, even with the gold clause.

The Germans had counted on the Young Plan to ease the Allies' demands. Their efforts backfired; although the payment obligations were slightly reduced, reparations once again were unconditionally transferable. The Germans had to both raise revenue for payments and then transfer that revenue into foreign currencies. The Young Plan lasted only

a brief time, as the world depression overtook events. President Hoover proposed a one-year moratorium on all war debt and reparations payments at the end of June 1931, and in June of 1932 the reparations debts were canceled.

Debt Issued by German Cities and States

The Dawes and Young loans are probably the most famous loans from this period, but others are equally important. The Weimar constitution enhanced Germany's federal character. Throughout the 1920s, each German state (*Land*) had considerable fiscal autonomy, including the right to float loans in Germany and abroad. (The Reich itself only took out two international loans in the 1920s—the Dawes and the Young.) The same was true for Germany's cities. Debts from World War I and reparations debt were clearly the duty of the federal or central government, but this entity had, at first, no direct control over borrowing by state and city governments. By the late 1920s state and local borrowing had become enormous.

The public-sector debt had two sources. After the war the government tried to buy social peace with pensions and state-sector salaries that were not sustainable under the tax system. The fraction of all income spent by the state rose from about 14.5 percent prior to the war to 24 percent in the second half of the 1920s. This problem appeared at the federal level and in several of the states, including the largest, Prussia. Municipal borrowing in particular reflected a desire to improve the living conditions of urban-dwellers who had suffered years of war and chaos. Cities borrowed to improve transportation and other public infrastructure, and in some cases to provide public cultural and sports facilities. Less healthy expenditures went to finance the construction of facilities such as harbors intended to lure companies from one city to another, or simply to feed the grandiose visions of city fathers. Almost 12 percent of all foreign loans issued in the United States between 1924 and 1929 went to German cities.

In the 1930s Germany defaulted on most internal debt as well as on the two international loans to the German federal government. The default reflected economic conditions primarily: the Great Depression in Germany was more severe than elsewhere in Europe, and the country already was heavily indebted. The 1932 Lausanne Conference formally ended Germany's reparations obligations, but the other debts remained. Even before the Nazis assumed power in 1933 the Reich took steps to limit payment on foreign debts. Germany could not legally leave the gold standard, unlike her major trading partners, and the relative over-valuation of the mark adversely affected her balance-of-payments situation and ability to service foreign debt.

Throughout the 1930s the German government implemented a series of steps aimed at reducing the service on bonds owned by foreigners. Some actions were transfer stops, which meant that the bondholder would be paid in marks but was forbidden to exchange those marks for another currency. Other bondholders were given new bonds representing the unpaid interest due on their loans. By the end of the 1930s the German government had simply stopped servicing most foreign debt and had taken steps to prevent even its private creditors from paying debts denominated in foreign currencies.

These defaults were very costly both for their direct and indirect effects; the political costs were especially large. Any default harms investors, and default on the Dawes, Young, and other interwar debt affected a particularly large group of investors, especially in the United States. Americans in the 1920s invested directly in debt and equity, and the

same enthusiasm that led to the run-up of the 1920s stock market also led many individuals to invest in international debt, especially German debt. Many of these individuals were, quite literally, widows and orphans, and the losses inflicted on them were especially acute. The identity of these bondholders colored the politics of both U.S. economic relations with the German government during the 1930s and the settlement of outstanding debts in 1953.

The debt itself, on top of the reparations obligations, was a staple of right-wing political complaint in Germany in the 1920s. One line of thought blames the rise of the Nazis on the unfairness of the Treaty of Versailles, emphasizing the reparations and supposed financial problems they created. This view risks blaming the Allies for the Nazis, who were, after all, elected by the German people. But it is true that Hitler reinvigorated his flagging political career by making an issue of the Young Plan. It is also true that broad sections of the German population viewed the reparations as illegitimate and the various international loans as only necessary because of the reparations and other features of the Treaty of Versailles. Tracing the rise of Hitler to the Treaty of Versailles to the Young Plan is too simple, however. Other political parties opposed the reparations, and the Nazis had much broader grievances than the Versailles treaty.

Postwar Debt

At the conclusion of World War II, Germany was divided into four zones, each separately administered by the United Kingdom, France, the United States, and the Soviet Union. The occupying power was legally responsible for the material welfare of the civilian population in its zone. To fulfill this obligation the governments of France, the United Kingdom, and the United States spent resources to ensure meeting the basic needs of the German civilian population. Under international law the occupying power had the right to consider such aid a loan to the government of the occupied country, and to expect repayment once the country's sovereignty was restored. Expenditures by the United Kingdom and especially the United States went far beyond basic civilian needs. The United States had two main programs. Government and Relief in Occupied Areas (GARIOA) had begun shortly after the war to provide for immediate needs, including food, fuel, and medical supplies. The GARIOA program reflected both concern about the extensive suffering of the German people in the winter of 1945–1946 and competition with the Soviet Union and its allies for the political allegiance of the German people.

The second set of loans was made under the auspices of the Marshall Plan (technically, the European Recovery Program). The Marshall Plan operated from 1948 to 1951 and was intended to foster long-term recovery through investment in productive facilities. The Marshall Plan included a substantial grant element, but some of the assistance was rendered in the form of loans. Marshall Plan assistance in Germany was initially weighted toward debt moreso than in other recipient countries. (Under the London Debt Agreement, discussed in the next section, much of the German debt obligation under the Marshall Plan was converted to a grant.)

These loans were unusual in one respect. While fully legal under international law, GARIOA loans were at first made to a Germany with no sovereign government. The United States and its Allies decided what to lend to Germany, in effect binding the Germans to repay on the terms dictated.

The London Agreement

After World War II, Germany and the Western occupying powers considered what to do about its enormous external debt. Part of this debt was for the postwar assistance just described, but much of it reflected the interwar debt that had been the object of transfer stops and default. The defeated Germany of 1945 owed huge sums dating back to the early 1920s. The three Western occupying Powers (the United Kingdom, France, and the United States) had in 1949 brought the three Western occupation zones together into the Federal Republic of Germany (or West Germany). The three powers insisted that Germany work out a settlement with all of its foreign creditors as one condition for restoration of full sovereignty. After some preliminaries, representatives of the parties met in London and eventually crafted the London Debt Agreement of 1953.

The Germans had their own reasons to make an accommodation with their foreign creditors. The German economy had always relied on export markets and badly needed foreign capital to restart its factories. The defaults of the 1930s complicated trade relations and made additional private lending virtually impossible; creditors used their political leverage to block imports from Germany to pressure the Germans into repayment, and few lenders were willing to extend fresh credit to a country with such poor credit history. Settling the debt issue was not just a matter of reckoning with Germany's past—although that was necessary—but also of normalizing economic relations with the rest of the world.

Chancellor Adenauer accepted Germany's responsibility to deal with most but not all of Germany's external debt. First, Germany would undertake to repay all public debt issued in Germany between the two world wars, including the obligations of the central government, the several states, and the municipalities. This included debts owed both to other governments and to private entities (investors who had purchased earlier German debt). Second, the Federal Republic recognized debts owed by German *private* debtors, so long as those debtors lived in the Federal Republic. With respect to the private debts, the German government accepted not the obligation to repay but to establish mechanisms to ensure repayment. These debts had to be included in the overall plan because private debt payments would affect Germany's overall transfer abilities. Third, Germany accepted responsibility for debt incurred by the Austrian government during the period of *Anschluss* with Germany. Finally, the Federal Republic acknowledged its responsibility for repayment of advances under GAROIA and the Marshall Plan.

Germany was not the first country to default on its external debt and to renegotiate that debt with its creditors. But there were several unusual features of the postwar situation. First, Germany was divided; the fourth occupation zone had been turned into a Soviet puppet state and did not participate in the London Agreement. Would the residents of West Germany have to assume all of the debt? The world expected them to do so; a creditor cared little whether the city he had lent to in 1928 ended up in the British or the Soviet occupation zone. Yet it was patently unfair to require the citizens of one of two successor states to assume all the debt. Second, some of the legal entities that had taken on the debt no longer existed. Prussia, for example, had been dissolved at Allied insistence. Part of its territory had been assigned to Poland and the Soviet Union after the war, and much was in East Germany. Who would assume Prussia's debts?

The agreement was crafted on the premise that Germany's actual payments could not endanger the short-term welfare of her people or her long-term ability to rebuild a shattered economy and society. Underlying most discussions were two important principles, one economic and one political. The economic issue was the transfer problem as posed by

Keynes; the Germans argued, successfully, that total payments had to reflect the German economy's ability to produce export surpluses. The political understanding was that, given the increasingly hostile relationship between the Soviet Union and the Western powers, it was not in the Allies' long-term interest to place the interests of Western creditors before the needs of the German people.

This basic understanding presupposed that the creditors would forgive some of the debt, agree to long repayment schedules for the rest, and be willing to renegotiate terms if circumstances arose that made debt service more onerous than originally thought. The actual agreement was the product of long and sometimes rancorous negotiations. but two decisions paved its way. The United States forgave most of the debt arising out of postwar assistance. This amounted, in practice, to forgiving much of the GARIOA debt and converting most Marshall Plan aid to a direct grant. Once the terms of the London Debt Agreement are taken into account, Germany's aid under the Marshall Plan had about the same mixture of grants and loans as that given to other major recipients. By itself the U.S. step marked a large reduction in the outstanding debt, thus making more resources available for other creditors. But the U.S. decision was also a political tactic, and as such succeeded: the U.S. write-down put pressure on France and the United Kingdom to write-down their own much smaller loans and also forced private creditors to accept significant reductions in their outstanding loans.

A second decision amounted to rewriting the terms of many of the original loans. All of the Young as well as the U.S. tranche of the Dawes loan had gold clauses. When the United States devalued the dollar in 1933, Congress passed legislation abrogating the gold clauses in all domestic credit contracts. But this legislation had no force for loans issued in Germany. Inflation in some European countries had been severe; a creditor owning a share of the Belgian franc Young tranche would, without the gold clause, receive payments that were only a few pennies on the dollar of the original face value. The London Debt Agreement struck an artful compromise. Creditors for most bonds were paid as if the original bond had a *dollar* clause rather than a gold clause. This decision reduced the amount the Germans had to pay and at the same time protected the creditors from the worst ravages of wartime inflation. Our hypothetical Belgian bondholder suffered a loss equal to that of the real value of the U.S. dollar, rather than the real value of his own currency.

Most commentators agree that prewar debts covered by the London Agreement of 1953 involved about 13.5 billion marks, 7.7 billion of which was public debt ($13.5 billion in 1953 would buy about the same basket of goods as would $92.8 billion in 2003). Unpaid interest on those debts amounted to another 2.6 billion marks. Postwar debts were about 16.2 billion marks. The agreement reduced the total prewar debt to about 7.5 billion marks, and the postwar debts to about 7 billion marks. The German government agreed to repay a total of 11 billion marks, of which 4 billion represented prewar debts. Another 3.5 billion marks was shared among private German debtors. Thus the reduction in the total obligation, both public and private, was about 50 percent.

The agreement also spread the payments out over a long time. From 1953 to 1958, only interest payments were due. This delay in making principal payments was intended to give the country some additional breathing room and to recognize the reparations Germany had agreed to pay to the State of Israel, which were due at the same time. Starting in 1958, Germany would have to make annual payments toward all debts public and private of 765 million marks. The 567 million marks of interest payments due in 1953 were less than Germany's 708 million mark trade surpluses with the rest of the world. As Germany's economic miracle took off, she exported more and more, leading to ever-larger trade surpluses.

By 1968 Germany ran a total trade surplus of 18.4 billion marks. The fixed payments under the London Agreement became less and less significant. Some loans had been entirely repaid by the 1960s, and most of the agreement was satisfied by the early 1970s. The last annual payment due under the original agreement was made, as planned, in 1983.

At the same time the Germans were negotiating the London Debt Agreement, they were dealing with the first stage of a much more serious debt, reflecting the horror inflicted on the Jewish people by the Nazi regime. The regime had murdered millions of Jews, and many others, including German citizens, were robbed of property and exploited as slave labor. As late as the year 2000, German firms and the German government were discussing claims for compensation for these acts. Adenauer and other German leaders involved in the London debt negotiations recognized that on both moral and practical grounds, Germany should make significant payments to the State of Israel and to Jewish groups in recognition of what the Nazis had done.

The State of Israel had named the sum of $1.5 billion when it first raised the matter of reparations in a note to the Allied governments in March of 1953. Adenauer agreed with the Israelis that no amount of material reparation would atone for the crimes committed and that negotiation on this issue was simply not appropriate, so he accepted the $1.5 billion figure. One billion dollars would go directly to the State of Israel, and another $500 million would go to the Conference on Jewish Material Claims against Germany, which represented individual victims and survivors. Some Germans involved in the London debt negotiations worried that Germany could not afford to pay both the Jewish claims and the creditors represented at the London debt negotiations, but in the event the payments to Israel and the Conference on Jewish Material Claims were made on time and without apparent stress.

Reunification

The London Debt Agreement made part of Germany's repayments conditional on one event, an event that triggered additional payments in 1990. According to Article 25 of the agreement, if Germany reunified, the parties to the agreement would adjust the plan in three ways. The most important of these clauses was the first, which alluded to a series of subclauses buried in Annex I to the agreement. These clauses allowed Germany to defer repayment of some back interest due on the Dawes and other prewar loans until reunification. The logic of this clause was twofold. First, at a political or moral level, it was not seen as appropriate to make the people of West Germany repay debts on behalf of the whole country when part of that country had evolved into a separate sovereign state. Second, this mechanism provided a safe way of conditioning German payments on her ability to repay. Participants in the London negotiations were nervous about making the payments conditional; in some sense this was the problem in the 1920s, when the Germans could hope to evade the reparations demands if they could make their economic situation look sufficiently dire. Some German business leaders argued against any reductions in the amounts outstanding, and any conditionality of repayments, on the grounds that Germany needed to show that she was a worthy debtor.

Given the way events unfolded, the contingency built into the London Debt Agreement is ironic. The agreement contemplated a circumstance in which reunification mean that Germany could afford to pay *more*, not less. The idea was that East Germany, with its own farms and factories, could afford to pay off some of the old obligations. But the East Germany that was absorbed into the Federal Republic in 1990 was nearly bankrupt and

Nr. A 025220

Nr. A 025220

£ 40

DEUTSCHE ÄUSSERE ANLEIHE 1924
(DAWES-ANLEIHE)
BRITISCHE AUSGABE
BEZUGSCHEIN

Dieser Bezugschein gewährt seinem Inhaber einen Anspruch auf Auslieferung von dreiprozentigen Schuldverschreibungen gemäß den Bestimmungen des Abkommens über deutsche Auslandsschulden vom 27. Februar 1953 und seiner Anlage I zur Fundierung von Zinsrückständen für die Zeit vom 15. Oktober 1944 bis zum 14. Oktober 1952 einschließlich auf eine Schuldverschreibung über £ 100 der ursprünglichen britischen Ausgabe der Deutschen Äußeren Anleihe 1924. Die Zinsrückstände, berechnet zu einem Satz von 5 v. H. jährlich ohne Zinseszinsen, haben einen Fundierungswert von nominal

£ 40
VIERZIG PFUND STERLING.

Die Fundierungsschuldverschreibungen werden im Falle der Wiedervereinigung Deutschlands gegen Übergabe dieses Bezugscheins ausgegeben.

Bad Homburg v. d. H., den 4. Januar 1960

GEGENGEZEICHNET ZUR BEGLAUBIGUNG:
FÜR DEN GOUVERNEUR UND DIE GEBELLSCHAFT DER BANK VON ENGLAND
COUNTERSIGNED FOR IDENTIFICATION:
FOR THE GOVERNOR & COMPANY OF THE BANK OF ENGLAND
CONTRESIGNE POUR CONTROLE:
POUR LE GOUVERNEUR ET LA COMPAGNIE DE LA BANQUE D'ANGLETERRE PAR

BEVOLLMÄCHTIGTER KASSIERER
AN AUTHORISED CASHIER
CAISSIER AUTORISE

GERMAN EXTERNAL LOAN 1924
(DAWES LOAN)
BRITISH ISSUE
RIGHTS CERTIFICATE

This rights certificate confers upon the holder a claim to receive 3% bonds in accordance with the terms of the Agreement on German External Debts of 27th February 1953 and of Annex I thereto in respect of the funding of arrears of interest for the period 15th October 1944 to 14th October 1952 inclusive on a bond for £ 100 of the original British Issue of the German External Loan 1924.
The arrears of interest, calculated at a rate of 5% per annum simple interest, have a funding value of

£ 40 nominal
FORTY POUNDS.

In the event of the reunification of Germany the funding bonds will be issued against surrender of this rights certificate.

Bad Homburg v. d. H., 4th January 1960

BUNDESSCHULDENVERWALTUNG

EMPRUNT EXTERIEUR ALLEMAND 1924
(EMPRUNT DAWES)
TRANCHE ANGLAISE
BON

Le porteur du présent bon a le droit de recevoir, conformément aux dispositions de l'Accord de Londres sur les dettes extérieures allemandes du 27 février 1953 et de son Annexe I, des obligations 3% à titre de consolidation des arriérés d'intérêts, dus pour la période du 15 octobre 1944 au 14 octobre 1952 inclus, sur une obligation de 100 Livres sterling de l'émission initiale de l'Emprunt extérieur allemand 1924 (tranche anglaise).
Les arriérés d'intérêts, calculés au taux de 5% (intérêts simples), ont, pour la consolidation, une valeur nominale de

40 Livres sterling
QUARANTE LIVRES STERLING.

Les obligations de consolidation seront délivrées, contre remise du présent bon, en cas de réunification de l'Allemagne.

Bad Homburg v. d. H., le 4 Janvier 1960

FÜR DIE BUNDESREPUBLIK DEUTSCHLAND
FOR THE FEDERAL REPUBLIC OF GERMANY
POUR LA REPUBLIQUE FEDERALE D'ALLEMAGNE
BUNDESSCHULDENVERWALTUNG

PRÄSIDENT VIZEPRÄSIDENT

München - Giesecke & Devrient - Berlin

"Schattenquoten" certificate for the British issue of Dawes Loan. January 4, 1960. This rights certificate confers upon the holder a claim to receive 3 percent bonds in accordance with the terms of the Agreement on German External Debts of 27 February 1953 (. . .) in respect of the funding of arrears of interest for the period 15 October 1944 to 14 October 1952 inclusive on a bond for £100 of the original British issue of the German External Loan 1924. The arrears of interest, calculated at a rate of 5 percent per annum simple interest, have a funding value of £40 nominal. In the event of the reunification of Germany the funding bonds will be issued against surrender of this rights certificate.

represented not additional resources the Federal Republic could use to satisfy old creditors but new burdens on the state treasury.

Each bond covered by this aspect of the 1953 agreement was split into two parts. One part was exchanged for a regular bond issued by the Federal Republic and serviced as called for in the agreement. The other, representing the back interest payments, was exchanged for a rights certificate (*Bezugschein*) that would, in case of reunification, entitle the owner to another bond for another set of payments.

The document above spells out the procedure; an individual who held a £100 Dawes bond at the time of the London Debt Agreement received, in addition to the payments agreed in 1953, this rights certificate. In the event of German unification the bondholder could trade the rights certificate for a new bond worth £40, which would be serviced in the usual way. For several decades the rights certificates were little more than curiosities, but with reunification the German debt administration exchanged the outstanding certificates for bonds like the one at left, as spelled out in the agreement.

Deutsche Äußere Anleihe 1924

(Dawes-Anleihe)

Schweizerische Ausgabe

№ 10080

Die Bundesrepublik Deutschland verpflichtet sich, dem Inhaber im Umtausch gegen diesen Bezugschein eine nach den Bestimmungen des Londoner Abkommens über Deutsche Auslandsschulden 1953 und seiner Anlage I ausgestellte Fundierungsschuldverschreibung im Nennwert von

200 Schweizer Franken

für Zinsrückstände der Deutschen Äußeren Anleihe 1924
(Schweizerische Ausgabe)

zu übergeben, jedoch nicht vor der Wiedervereinigung Deutschlands.

Der in dieser Fundierungsschuldverschreibung verkörperte Anspruch entspricht dem Fundierungswert von zwischen dem 16. Oktober 1944 und dem 15. Oktober 1952 aufgelaufenen 8 Halbjahreszinsen von je 25 Schweizer Franken.

Bad Homburg v. d. H., im Jahre 1953

BUNDESSCHULDENVERWALTUNG

Für die Bundesrepublik Deutschland
Bundesschuldenverwaltung

Präsident Vizepräsident

Bundesdruckerei

"Schattenquoten" certificate for Dawes Loan, Swiss issue. 1953. Swiss issue of a rights certificate for back interest on the Dawes Loan of 1924, payable in the event of reunification of Germany.

Conclusion

Germany's twentieth-century history has been written from many perspectives, and from any of them—military, political, moral—this history offers extremes of human conduct. One can also write Germany's twentieth-century history as a story of debt. Fighting World War I required enormous borrowing; losing the war saddled Germany with huge additional obligations in the form of reparations. Restarting the German economy and allowing her people to share in the prosperity of the 1920s entailed fresh borrowings. The Nazi regime repudiated most of that debt in the 1930s (although a more reasonable regime might have been forced to follow a similar course). The victorious Allies had to lend the German people even more money to sustain them and to help them rebuild their economy.

The decades since the Second World War have meant, for the people of Germany, a process of reckoning with the past and reconnecting to the world community. An important first step in that process was acknowledging their debts, both moral (to the Jewish people and the State of Israel) and financial (formalized in the London Debt Agreement). The reunification of Germany in 1990 triggered the last stage of this financial responsibility, as the German government repaid debts that had been postponed at the London negotiations. Some of Germany's moral creditors may never view her debts as fully satisfied. But Germany has now left behind, on honorable terms, a century in which financial debt was the means, then the cause, and finally the consequence of war.

20
King Leopold's Bonds

ROBERT HARMS

In the summer heat of 1908, the furnace in the Palace of Brussels ran day and night for an entire week. King Leopold II was burning the archives of the Congo Independent State, a country that had been his private possession for twenty-three years and now was about to be taken away from him by the Belgian government. "They will have my Congo," he declared, "but they will not know what I did there."[1]

Despite the king's best efforts, many documents relating to the history of the Congo Independent State have survived. Among them is a bond that was issued on February 7, 1888, to raise 150 million Belgian francs to finance the Congo Independent State. The bond itself displays symbols of the anticipated wealth of Africa. There are palm trees, maize plants, and cotton, but nothing that reflects the real exports of the Congo at the time, which were ivory and rubber. It also displays symbols of the Congo's anticipated economic development. In the upper right corner is a train, and in the upper left corner is a steamboat. The railroad did not yet exist in 1888, but several steamboats were already plying the upper stretches of the Congo River. The name *État Indépendant du Congo* is written across the top in large letters, and below that in smaller letters is the explanation that the bond, with a face value of 100 Belgian francs, could be redeemed in ninety-nine years for a premium, or at an annual increase of 5 francs.

Between 1885 and 1908 the Congo Independent State was a colony like no other. At a time when the major European powers were planting colonies all over the globe, the Congo was the personal colony of one man—King Leopold II. The shaky financial structure that underpinned the activities of the Congo Independent State included bonds, unissued bonds, coerced loans, fake loans, a lottery, concessions of territory, stocks held by legitimate investors, and stocks held by straw men.

This chapter will explore some of the schemes that Leopold developed to finance his colony. It will argue that despite all the creative financing, the Leopoldian system never became financially sustainable. Historians have generally depicted the Belgian government's takeover of the Congo in 1908 as a major blow to Leopold, but I will suggest that it may have been his grandest scheme of all. He managed to pawn off a bankrupt and debt-ridden colony onto the Belgian government while augmenting his personal fortune.

As a legal entity, the Congo Independent State had several antecedents. The earliest was the International African Association, formed during the Brussels Geographical Conference in 1876 for the ostensible purpose of opening central Africa to commerce from the principal European powers, including England, France, Belgium, Germany, Austria-Hungary, Russia, and Italy. The chairmanship of the IAA was supposed to rotate annually among the signatory powers, but in fact it never had any chairman besides Leopold II. The chairman was to be assisted by an international executive committee, but it functioned only sporadically until 1880 and then ceased to operate. There were also supposed to be national committees in each of the founding nations, but the only national committee that was ever formed was the Belgian committee, which was dominated by Leopold.[2]

The direct forerunner for the Congo Independent State was the International Congo Association.[3] Formed in secret by King Leopold as a substitute for the moribund International African Association, the ICA first came to public notice in 1882. Unlike its predecessor, this association had only one member: King Leopold II. It was a totally fictitious organization, a shell for the king's ambitions. Yet it was recognized as a sovereign power by the United States and Germany, and then by the fourteen participants of the Berlin Africa Conference of 1884–1885.

The finances of the International Congo Association came entirely from Leopold's personal fortune. During the years 1882 to 1885 he financed the ICA with 2.5 million Belgian francs per year. Between 1876, when the International African Association was founded, and 1885, when the Congo Independent State was born, Leopold poured 11.5 million francs into the exploration and occupation of the Congo.[4]

The fictitious organization financed by one man gained control over an African territory nearly as large as Western Europe because Leopold promised the other nations freedom of trade with no customs duties or taxes. He sought control of the region, he claimed, in order to make it a free trade zone in which all nations could profit. An early version of this promise could be seen in a letter that the chief of Leopold's cabinet wrote to Sir John Kirk in 1883: "His Majesty wants me to tell you confidentially that if England, alone or with other powers, were willing to proclaim the neutrality of the mouths of the Congo and to acknowledge the neutrality of our stations, we would take the engagement not to establish customs or any tax on our roads."[5]

A year later, Prince Otto von Bismarck showed the French ambassador a map of Leopold's proposed Congo. "It is certainly vast," Bismarck told the ambassador, "but it is not to us to dampen these ambitions as long as the [International Congo Association] guarantees us freedom of trade and applies that principle throughout its operations."[6]

Given that England, France, Portugal, and Britain were already spending vast amounts of money exploring and colonizing other parts of Africa, the promise of a free trade zone financed by Leopold in the heart of Africa was too tempting to ignore.

The Berlin act, signed by twelve European nations plus the United States and Turkey on February 26, 1885, during the Berlin Africa Conference, did not mention the International Congo Association by name, but it declared a free trade zone covering the Congo basin and proclaimed the region politically neutral. The question of who was to enforce this neutrality was settled at the last session of the conference when Bismarck read a declaration from Leopold establishing the Congo Independent State and accepting the terms of the Berlin act.

With political control of the Congo guaranteed, Leopold was eager to begin the economic exploitation of the region. This would require permanent government stations, an army, steamships to ply the middle stretches of the Congo River, and a railroad to carry rubber, ivory, and other goods around the rapids of the lower Congo. Leopold was convinced that the investments would pay for themselves many times over, but a substantial amount of capital was necessary to get started.

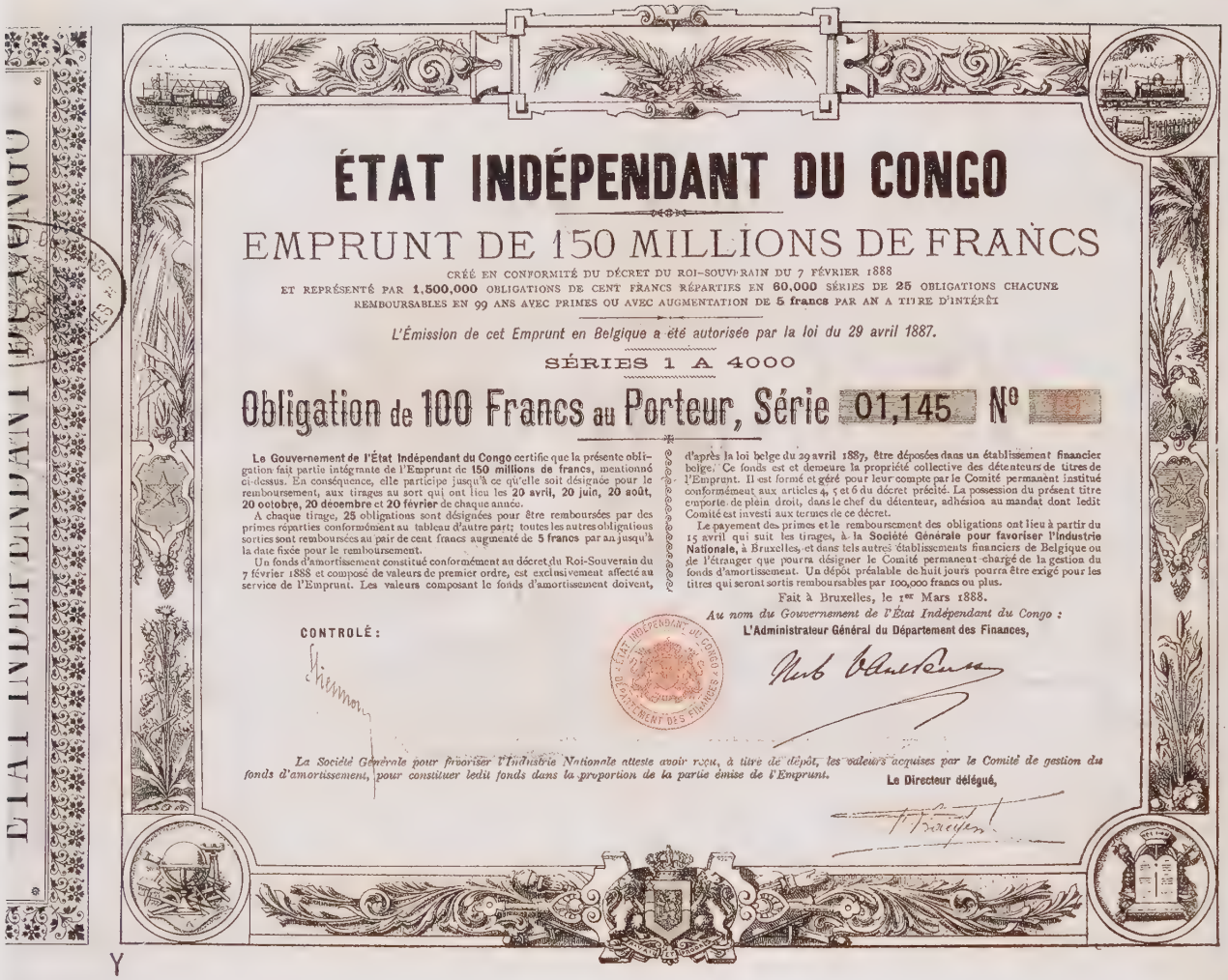
The financial situation was grim. A scheme that relied on the French financier Jaubert to raise 400 million francs that would be guaranteed by the French government in return for an adjustment of the border with the French Congo fell apart. A subsequent plan to let Leopold run a 20 million franc lottery in France in return for the border adjustment was derailed by a change in the French government. In 1886 the state stations along the middle Congo were abandoned to save money. A young officer on Leopold's Congo staff reported that the king "repeats ten times a day that we are going bankrupt and that he doesn't know how he can pay up, that the bankers won't lend him any more money, etc. etc. Our Gracious Sovereign is like this all the time."[7]

Bonds

Out of such desperation came the bond scheme. Leopold's first move was to replace his current chief minister with Auguste Beernaert, a loyal supporter who had previously served as vice president of the Belgian Committee of the International African Association. After voicing initial skepticism Beernaert agreed to support Leopold on the bond issue, and the Chamber concurred in 1878 after a fractious and bitter debate. The government would issue 150 million francs' worth of Congo Independent State bonds. After France was offered yet another adjustment of the Congo's border with the French Congo, it agreed to sell 80 million francs' worth of these bonds on the Paris stock exchange.[8]

There remained the problem of how to guarantee the bonds. The Société Générale, the Rothschilds, and the French banks at first refused to help, and Leopold proposed a desperate scheme by which Belgium's National Bank would give *moral* (but not financial) support to the bonds. Finally, Beernaert managed to put together a consortium that consisted of the Société Générale; the Banque de Paris et des Pays-Bas; the Banque de Bruxelles; L. Lambert; Philippson, Horowitz, et Cie.; Cassal et Cie.; and Baiser et Cie.[9] The bonds came on the market in February 1888.

Like most elements of the Congo's finances, the bonds differed from any of its kind that had ever been sold in Belgium or France. Each bond bore a face value of 100 francs, redeemable in ninety-nine years. Some bonds could be redeemed earlier, however, and the redemption date would be determined by a lottery held six times per year. At each lottery twenty-five shares would be chosen for redemption at premium prices. At the initial draw-


ÉTAT INDÉPENDANT DU CONGO
EMPRUNT DE 150 MILLIONS DE FRANCS
CRÉÉ EN CONFORMITÉ DU DÉCRET DU ROI-SOUVERAIN DU 7 FÉVRIER 1888
ET REPRÉSENTÉ PAR 1,500,000 OBLIGATIONS DE CENT FRANCS RÉPARTIES EN 60,000 SÉRIES DE 25 OBLIGATIONS CHACUNE
REMBOURSABLES EN 99 ANS AVEC PRIMES OU AVEC AUGMENTATION DE 5 francs PAR AN A TITRE D'INTÉRÊT
L'Émission de cet Emprunt en Belgique a été autorisée par la loi du 29 avril 1887.
SÉRIES 1 A 4000
Obligation de 100 Francs au Porteur, Série 01,145 N°
Le Gouvernement de l'État Indépendant du Congo certifie que la présente obligation fait partie intégrante de l'Emprunt de 150 millions de francs, mentionné ci-dessus. En conséquence, elle participe jusqu'à ce qu'elle soit désignée pour le remboursement, aux tirages au sort qui ont lieu les 20 avril, 20 juin, 20 août, 20 octobre, 20 décembre et 20 février de chaque année.
A chaque tirage, 25 obligations sont désignées pour être remboursées par des primes réparties conformément au tableau d'autre part; toutes les autres obligations sorties sont remboursées au pair de cent francs augmenté de 5 francs par an jusqu'à la date fixée pour le remboursement.
Un fonds d'amortissement constitué conformément au décret du Roi-Souverain du 7 février 1888 et composé de valeurs de premier ordre, est exclusivement affecté au service de l'Emprunt. Les valeurs composant le fonds d'amortissement doivent, d'après la loi belge du 29 avril 1887, être déposées dans un établissement financier belge. Ce fonds est et demeure la propriété collective des détenteurs de titres de l'Emprunt. Il est formé et géré pour leur compte par le Comité permanent institué conformément aux articles 4, 5 et 6 du décret précité. La possession du présent titre emporte de plein droit, dans le chef du détenteur, adhésion au mandat dont ledit Comité est investi aux termes de ce décret.
Le payement des primes et le remboursement des obligations ont lieu à partir du 15 avril qui suit les tirages, à la Société Générale pour favoriser l'Industrie Nationale, à Bruxelles, et dans tels autres établissements financiers de Belgique ou de l'étranger que pourra désigner le Comité permanent chargé de la gestion du fonds d'amortissement. Un dépôt préalable de huit jours pourra être exigé pour les titres qui seront sortis remboursables par 100,000 francs ou plus.
Fait à Bruxelles, le 1er Mars 1888.
Au nom du Gouvernement de l'État Indépendant du Congo :
L'Administrateur Général du Département des Finances,
CONTROLÉ :
ÉTAT INDÉPENDANT DU CONGO DÉPARTEMENT DES FINANCES
La Société Générale pour favoriser l'Industrie Nationale atteste avoir reçu, à titre de dépôt, les valeurs acquises par le Comité de gestion du fonds d'amortissement, pour constituer ledit fonds dans la proportion de la partie émise de l'Emprunt.
Le Directeur délégué,
ÉTAT INDÉPENDANT DU CONGO
Y

King Leopold's bond. 1888. Certificate issued by the Independent State of the Congo in 1888.

ing, the first share drawn could be redeemed for 200,000 francs, the second and third shares for 2,500 each, the fourth and fifth for 500 francs each, and the remaining twenty for 200 francs each. Other shares drawn in the lottery could be redeemed for the face value of 100 francs plus 5 francs per year. This 5 franc annual increase was not true interest because it could not be compounded; a bond held for ten years, for example, would be redeemed for 150 francs. Shares that did not get chosen in the lottery could be redeemed after ninety-nine years.[10] Writing in 1899, J. Plas and Victor Pourbaix declared that the bonds were "a new idea, interesting, a correct idea has been launched onto the financial terrain."[11]

The bonds were to be issued in three installments. The first issue of 100,000 shares went on sale for 83 francs each on February 14, 1888. Shortly thereafter the prices began to fluctuate wildly on the Belgian stock exchange, and Leopold began purchasing the shares himself in order to keep the price up. By the time the second installment, which consisted of 600,000 shares, was ready for release on February 6, 1889, the share price for the first installment was well below the 84 franc offering price of the second. Only 260,000 shares of the second installment were sold. The final 800,000 shares were to be

issued in 1892, but with most of the second installment still unsold, the third installment was never released.[12]

Why did the bonds fail to raise the expected cash? Plas and Pourbaix argued that the public was put off by the novelty of the bonds and that they needed more time to get used to them. Albert Thys, a high-ranking colonial official, blamed it on the Belgian financial community:

> The loan did not succeed, not because it was badly conceived, and not because of the public, who gave it an absolutely miserable reception at the beginning. It was above all the financiers who refused to accept it and declared immediately that it was a bizarre form of loan, lacking the payment of interest, and that the public would never accept such an original idea.[13]

In addition, the bonds did not give a good return on the investment. Because the bond did not earn compound interest, a bond purchased for 100 francs and held for ninety-nine years would yield 595 francs when cashed in, making a compound interest rate of only 1.82 percent per year.[14]

Leopold tried to publicize his bleak financial situation by taking measures such as mortgaging the livery of his servants and cutting out one course from each of his lunches. He even pressured the Catholic Church to buy his bonds, arguing that by doing so they would support evangelization in the Congo. As the financial situation got more and more precarious, Leopold looked gaunt and often appeared distracted. One day as he paced up and down in the palace, his wife cried out, "But Leopold, you will ruin us with your Congo!"

When the bonds failed to provide the necessary funds, Leopold sought to persuade the Belgian government to give him direct loans. In return for a 25 million franc loan, he wrote a will leaving the Congo to Belgium after his death. The agreement, which was concluded in 1890, proffered the loan at no interest for ten years, but at the end of that period the Belgian government had the right to take over the Congo if it so chose. If the government chose not to take over the Congo, then the loan would be extended for another ten years at an annual interest of 3.5 percent.[15] A key condition of the loan was that Leopold should not take out any additional loans without the permission of the Belgian government.

Five years later Leopold was again in need of funds, but he could not go back to the Belgian government without an elaborate ruse. He "confessed" that he had secretly taken out a 5 million franc loan from the Antwerp banker Alexandre de Browne de Tiège. The loan had been secured, he said, by a 16 million hectare (more than 6 million square miles) tract of land in the Congo. If the loan were not repaid with 6 percent interest by July 1, 1895, the mortgaged land would revert to Browne de Tiège. Research by Jean Stengers has shown that the loan was a piece of fiction.[16] Nevertheless, not wanting to lose such a vast territory, the Belgian cabinet voted for a loan of 5,287,415 francs to repay Browne de Tiège, and another 1,5170,000 francs to cover budgetary shortfalls of the Congo Independent State.

Concession Companies

Even though the Congo Independent State was founded on the principles of free trade and political neutrality, Leopold quickly ignored them and began chartering Belgian companies to control the commerce and transportation networks of the Congo. Three

trading companies were formed and chartered between 1886 and 1888, followed by the Congo Railroad Company in 1889.

At the same time, Leopold was eager to begin exploiting the natural resources of the Congo. In 1885, shortly after the foundation of the Congo Independent State, he declared state ownership of all "vacant land" without defining the term. Because the country was sparsely populated and the inhabitants practiced a shifting cultivation that left much of the arable land fallow at any given time, the state was in a legal position to seize any land that it wanted. In 1891 Leopold cornered the mineral exploration rights in Katanga with the formation of the Katanga Company, though it would be years before any mines began to produce. More immediate returns would come from collecting wild rubber and ivory in the equatorial forests. In 1889 the Congo Independent State set aside the areas of the forest most accessible to the river transportation system for exploitation by persons or companies who held special concessions from the Congo state. This was followed in 1892 by a decree that Africans who collected ivory and wild rubber must sell them only to agents of the Congo state or to state-chartered concession companies.

Having proclaimed control of the forest resources, state agents began raiding African villages and demanding that the villagers give up any personal or hidden stocks of ivory. In 1891 missionaries in the Maringa and Lopori River basins reported hundreds of houses burned and fields blackened as a result of such tactics. But once the stockpiles of ivory had been confiscated, the supplies diminished rapidly and state agents became interested in rubber, which the local populations extracted from the *landolphia* vines growing wild in the forest. In April 1892, a state agent attacked a village and captured prisoners, demanding twenty baskets of rubber as ransom. A few weeks later he extracted rubber from another village in the same way. By July the state was collecting tax in the form of rubber, and by September it was making war on all the villages along the Lulonga and lower Maringa Rivers in order to expand the tax base. Although these measures produced almost a metric ton of rubber per month, the results were insufficient to solve the state's financial problems.[17]

To raise the capital for more effective exploitation of the forests, Leopold parceled out huge tracts of land—usually many times larger than Belgium itself—to chartered concession companies. The two major rubber concession companies, Abir and the Société Anversoise, were formed in August 1992. A closer look at them will illustrate the complex financing and disastrous effects of the rubber concession system.

In 1892 Leopold II convinced Col. John Thomas North, an Englishman who had made a fortune speculating on nitrates in Chile, to invest 40,000 pounds sterling in a rubber enterprise in the Congo. As a result the Anglo-Belgian India Rubber and Exploration Company, later known simply as Abir, was founded in Antwerp on August 6, 1892. The founders were Col. John Thomas North, Capt. Henry North (probably a relative of the colonel), Ernest Spencer, a member of the British Parliament, and five investors from Belgium, including Arthur Van den Nest, the deputy mayor of Antwerp.[18]

The company had capital of 1 million francs, divided into 2,000 shares of 500 francs each. Since the company allowed people to purchase shares with a 10 percent down payment, only 232,000 francs were initially invested. The three British stockholders, led by Col. North, owned 1,880 shares, and the five Belgian stockholders owned only 120. In addition to the capital stocks, 2,000 *actions de jouissance* were created. The profits of the company were to be divided among the holders of these *actions* after a dividend of 6 percent had been paid on the capital stocks. The company was to give half of its *actions de jouissance* to the Congo Independent State.[19]

In 1898 Abir, which was legally incorporated under Belgian law, liquidated and immediately reconstituted itself under the laws of the Congo Independent State in order to escape Belgian taxes and controls. The capital of the reconstituted company was divided into 2,000 shares without designation of value. Each part represented simply one two-thousandth of the capital. The *actions de jouissance* disappeared. By this time Col. North had died and his heirs had sold his stocks for 1 million francs to Van den Nest, who resold most of them and retained only 25 shares.[20]

In the reconstituted company, the main stockholder was Alexandre de Browne de Tiège, the Antwerp banker who had collaborated with Leopold in the fictitious loan scheme. In addition to being a stockholder of Abir he was president of the Société Anversoise, the other large rubber concession company, in which he held 1,000 out of 3,400 shares. As an Abir stockholder, he held sixty shares in his own name and a thousand shares as a proxy for the Congo state. The state thus held ownership of 50 percent of Abir. (It is likely that the 1,000 shares that Browne de Tiège held in the Société Anversoise were also proxy shares for the Congo state.) The second largest Abir stockholder was the Société Anversoise itself, holding 150 shares.

In return for the company's investment, the Congo Independent State gave Abir full proprietorship of the land in the basins of the Maringa and Lopori Rivers—a territory more than three times the size of Belgium—and the exclusive right to exploit all the products of the forest for a period of thirty years. The Africans who lived in the area were to collect wild rubber for the company in lieu of paying taxes to the state. To enforce the collection of rubber, the company received rights of police and powers of bodily detention. The state would build posts for the company, supply the company's private army with guns and ammunition, and provide state soldiers to help keep order in the concession. Construction of the Abir headquarters in Basankusu was barely under way in January 1893 when the African populations of the Maringa and Lopori valley rose in revolt against the rubber impositions.

The conquest of the concession area by the forces of Abir and the Congo state was slow and bloody. By 1898, when the financial structure of Abir was reorganized, Abir had established rubber collecting posts in all parts of its concession, and the fighting that had characterized the initial expansion had somewhat diminished. By 1903 Abir had established forty-nine posts, and by 1906 its rubber rolls contained the names of 47,000 Africans.

The company agent at each post made a list of all the adult males in the villages under his control and assigned each village a quota based on three to four kilos of dried rubber (six to eight kilos of fresh rubber) per fortnight. To assure that the quotas were met, each Abir agent commanded a force of twenty-five to eighty African "post sentries" armed with modern Albini rifles. Their main jobs were to punish villages that failed to meet their quotas and to crush rebellions. If a rebellion became too large, the agent could call on the state forces stationed at Basankusu, at the confluence of the Maringa and Lopori Rivers, who could reach any part of the concession within a few days by steamboat. In addition to the post sentries, each agent commanded a force of sixty-five to one hundred fifty African "village sentries," who were stationed in the villages and armed with muzzle-loading guns.[21]

Africans collected rubber by going into the equatorial forest and finding wild *landolphia* vines. They would make incisions in the vines and collect the sap in a small earthenware pot. Every fortnight the villagers had to assemble with their rubber. They would then march under the surveillance of the village sentries to the nearest Abir post, where the rubber was weighed.

Map of the Congo Independent State showing the concession areas.

Men who fell short of their quotas were imprisoned and put to work drying rubber or doing odd jobs. Frequent offenders were deported to hard labor detention camps located on the upper Maringa and the upper Lopori Rivers. Because a man could not gather rubber while in prison, some agents took wives or children as hostages or imprisoned the village chief until the quota was complete. The records of one post show that forty-four chiefs were in prison during July 1902 alone.

Violence was endemic to the process of rubber collecting. In 1899 a state agent wrote, "The only way to obtain rubber is to fight." He went on to observe that the quantity of rubber collected by each post was directly proportional to the number of rifles it possessed. A single Abir post in 1903 imported 17,600 Albini rifle cartridges, 22,755 loads for muzzle loaders, 33 Albini rifles, and 126 muzzle loaders. In order to make sure that the African sentries did not waste or sell the rifle cartridges, some state and company officials demanded that for each cartridge expended, sentries should produce a human right hand.[22]

For the company, the rubber export business proved a lucrative one, especially when the price of rubber on the Antwerp market doubled between 1894 (when Abir first began exporting rubber) and 1905, going from 6.20 francs/kilo to 12.675 francs. The cost of producing the rubber was low. Ferdinand Goffart calculated that the price of producing a

kilo of rubber in 1897, including transportation, duty, and storage, was 1.35 francs,[23] whereas the selling price in Antwerp fluctuated between 6.30 and 7.80 francs that year. Abir's profits quickly rose from 131,000 francs in 1892 to nearly six million francs in 1900. Each year from 1896 to 1904 the profits ranged from one to six times the original investment of 1 million francs.

With such high profits, the value of Abir shares skyrocketed. From their original value of 500 francs in 1892, shares hit a high-water mark in 1900 at 25,250 francs. By 1898 Abir stocks had become so expensive that they were divided into tenths so that more people could afford to buy them. After 1897 the yearly dividend per share regularly exceeded the original value of the stock. In 1899 Plas and Pourbaix wrote:

> Thus, after a few years of operating, and despite the onerous conditions of exploitation and the difficulties relating to importing and exporting, the Anglo-Belgian India Rubber Company has in a single fiscal year made a net profit that represents more than twelve times the initial capital investment. Such a result is perhaps without precedent in the annals of our industrial companies.[24]

The profits from Abir contributed handsomely to the coffers of the Congo Independent State. Since the state owned half of the shares, it received half of the dividends paid by the company. In addition the state received a yearly tax equal to 2 percent of Abir's profits and an export duty of .50 francs per kilo of rubber. Calculations for the high-profit year of 1900 show that Abir paid 2,567,880.50 francs in dividends, duty, and taxes, representing roughly 11 percent of the total state revenue for that year.[25]

Despite the rising production and high profits, the Abir system was not sustainable. Companies such as Abir and the Société Anversoise did not engage in actual production but simply plundered the forest of its available resources. The *landolphia* vines that produced the rubber were thinly scattered throughout the forest with an average of less than one per acre. Frequent tapping of a vine caused it to die, and in many cases workers in a hurry to meet their quotas simply cut off the vines to gain access to the more inaccessible sections, killing them in the process.

All the rubber within a ten-kilometer radius of the Abir headquarters in Basankusu was exhausted after less than a year and a half of operation.[26] By 1904 an observer noted that the rubber was exhausted within a fifty mile radius of all but a few Abir posts. In that same year a missionary made a five-day trip through the forest without seeing a single live rubber vine.[27] As the search for rubber to meet village quotas got more desperate, one villager described the situation as follows: "We went seeking rubber until we met the people of the Tshuapa, and then we went towards the Ikelemba, and then the white man told us to cut the vines, and we cut them, and now what is there left?"[28] In 1905 a missionary visited a group of people who had abandoned their village and were hiding in the forest for fear that the company sentries would kill them. The headman told him, "Tell them [the rubber agents] that we cannot and therefore will not find rubber; we are willing to spend our strength at any work possible, but the rubber is finished. If we must either be massacred or bring rubber, well let them finish us off, and then I suppose they will be satisfied."[29]

In desperation, many people began to migrate out of the Abir concession; others rebelled. Abir reported 142 sentries killed and wounded during the first six months of 1905. When Viscount Montmorres visited the Abir concession in 1905, he reported that villages had been abandoned all over the territory, and people were living in rude leaf shelters built in the thickest parts of the forest.[30]

IN THE RUBBER COILS.

Right: "The Royal Python": *Punch* attacks the "Rubber System." *Punch*, November 28, 1906.

Opposite: Share certificate, Société Anniversoise.

From a peak production of 951 tons in 1903, Abir's production fell to 487 tons in 1904 and 358 tons in 1905. This decline was mirrored in the stock prices, which fell from 13,000 francs in 1904 to 6,700 francs in 1905. The directors of Abir blamed the problem on rebellions that, they claimed, were fomented by missionaries, but they knew that the rubber supplies were finished.

In March 1906, with rubber production grinding to a halt, the Abir director quietly suggested a state takeover of the concession. After a series of secret negotiations, the company signed an agreement on September 12, 1906, in which it agreed to give the Congo state all future income resulting from its concessions. In return, the state promised to take over the collection of rubber and pay Abir 4.50 francs per kilo for all rubber exported from the concession until 1952. This time it was Leopold who made the bad bargain. Believing that there was still rubber in the region, he told Abir shareholders in 1907 that he planned to have rubber production back up to normal within two years.[31]

In April 1906 Leopold sent out a force of twelve European officers and 650 soldiers under the command to Inspector Gerard to restore rubber production in the Abir territory. Gerard fought for fourteen months and still failed to bring the entire territory under state control. When he left in June of 1908 he confirmed that there was almost no rubber left in the concession. The state fixed the tax rate at six kilos per year (as opposed to three to four kilos per fortnight during the Abir days), but many people had trouble finding even that much. The state had invested considerable resources in reconquering the territory and received almost nothing in return.

The cycle of boom and bust that characterized the Abir concession was mirrored by its neighbor to the north, the Société Anversoise, which controlled a concession in the Mongala River basin that was somewhat larger than Abir's. Like Abir, the Société Anversoise was reorganized in 1898, with the Congo state receiving half the shares. Like Abir, it used

SOCIÉTÉ ANVERSOISE DU COMMERCE AU CONGO.

Société Anversoise du Commerce au Congo

SOCIÉTÉ A RESPONSABILITÉ LIMITÉE

Constituée le 23 Décembre 1897

Avoir Social représenté par 3400 Parts sociales au Porteur

UN DIXIÈME DE PART SOCIALE N° 749

Siège Social : MOBEKA,
Siège Administratif : ANVERS, le 23 Décembre 1897.

UN ADMINISTRATEUR, UN [redacted]R.

TISSUS
PERLES
LAITONS
MERCERIE
BIMBLOTERIE
FERBLANTERIE
MATERIEL AGRICOLE & MATERIEL
DIVERS-MACHINE

EPICES
HUILE DE PALME
PALMISTE
ARACHIDES
CAFE
CACAO
TABAC
COPAL
CIBE
CAOUTCHOUC
TEXTILES
TEINTURES
etc etc

DISTRICT DES BANGALAS

DISTRICT DE L'EQUATEUR

1897

MÉRIMÉRIE BELLEMANS FRÈRES, MARCHÉ AUX ŒUFS, 12, AN

LE PRÉSENT TITRE EST ACCOMPAGNÉ D'UNE FEUILLE DE COUPONS.

violence to extort rubber from the African villagers. Most of the details of its operations remain unknown, but in 1901 Edgar Canisius, a company agent, reported on a punitive expedition that resulted in the massacre of more than 300 Africans near the village of Bobadi. Having a larger territory than Abir, the Société Anversoise also had larger profits. In 1898, for example, the Société Anversoise reported a profit of 3,986,832 francs, as compared to 2,482,686 for Abir.[32]

Even by 1901, however, the rubber resources of the Société Anversoise were being depleted. Edgar Canisius reported the following:

> Of late the people have been compelled to so frequently tap the vines that the latter soon dry up and die. Each tribe has only a limited extent of forest which it can call its exclusive domain, and it consequently very frequently happens that when their own 'bush' is worked out, that the natives from one village penetrate the territory of the other in defiance of tribal usage. Such an invasion is naturally resented by their neighbors, who, equally pressed no doubt by circumstances and the white man, are themselves experiencing difficulty in making up the quota of rubber definitely fixed for each village, and a deficient production of which may entail dire punishment and even death.[33]

Between 1903 and 1905 rubber production in the Société Anversoise concession fell from 526 tons to 90. In response to embarrassing reports of atrocities, the Congo state temporarily took over the Société Anversoise concession in 1904, and later officially reclaimed it on September 12, 1906, the same day that it took over Abir.

Domaine de la Couronne

The largest rubber concession of all was a territory ten times the size of Belgium that King Leopold secretly allocated to himself. This was the Crown Domain, or *Domaine de la Couronne*. So secret was the operation that for many years the Belgian government was unaware that it existed. Like the Abir and Société Anversoise concessions, the Crown Domain was plundered for its rubber and ivory. Nobody knows just when the exploitation began, but by 1897 fifteen state agents accompanied by armed African sentries were established in the area and were beginning to conquer the villages and force the African population to collect rubber.

At first the Africans were delighted to be paid in beads and cloth for the rubber they were ordered to collect, but the payments were gradually reduced and finally the people were ordered to bring in rubber for nothing. When the Baptist missionary A. E. Scrivner traveled through the area, Africans described what had happened when the state soldiers first demanded that they collect rubber for nothing. Scrivner wrote:

> To this they tried to demur, but to their great surprise several were shot by soldiers and the rest were told with many curses and blows to go at once or more would be killed. Terrified, they began to prepare their food for the fortnight's absence from the village that the collection of rubber entailed. The soldiers discovered them sitting about. "What, not gone yet?" Bang, bang, bang and down fall one and another dead in the midst of wives and companions. There is a terrible wail, and an attempt is made to prepare the dead for burial, but this is not allowed. All must go at once to the forest. Without food? Yes, without food. And off the poor wretches had to

go without even their tinder boxes to make fire. Many died in the forests of exposure and hunger, and still more from the rifles of the ferocious soldiers in charge of the post.[34]

Although outsiders were not welcome in the Crown Domain, some refugees from the rubber atrocities managed to tell the British consul Roger Casement what happened when the rubber vines began to get depleted.

> It used to take ten days to get twenty baskets of rubber—we were always in the forest and when we were late we were killed. We had to go further and further into the forest to find the rubber vines, to go without food, and our women had to give up on cultivating the fields and gardens. Then we starved. Wild beasts—the leopards—killed some of us when we were away working in the forest, and others got lost or died from exposure and starvation, and we begged the white man to leave us alone, saying we could get no more rubber, but the white men and their soldiers said: 'Go! You are only beasts yourselves, you are *nyama* [meat].' We tried, always going further into the forest, and when we failed and our rubber was short, the soldiers came to our towns and killed us. Many were shot and some had their ears cut off; others were tied up with ropes around their necks and bodies and taken away.[35]

Events in the Crown Domain followed a boom and bust cycle similar to those in the concessions of Abir and the Société Anversoise. When Scrivner traveled through the area in 1903 he saw:

> Still more numerous sites where only recently thousands of people had been living. Cassava still growing on the plantations and bananas rotting on the trees. Here and there a few blackened sticks showed where the huts had been, and sometimes the huts were seen fairly well preserved and with cooking utensils lying about. But never a man or woman or child. All was as still as the grave.[36]

It is difficult to ascertain the production and profits of the Crown Domain because its records were all destroyed in 1908. In 1906 Belgian Professor Félicien Cattier estimated the profits for the ten-year period from 1896 to 1905 at roughly 7 to 8 million francs per year. Actual figures are available for the years 1906 to 1908, when the rubber resources were already suffering from significant depletion. They show profits from rubber production at 6.5 million francs in 1906, 5.9 million in 1907, and 2.9 million in 1908. The big drop in 1908 most likely represents the increasing depletion of the rubber resources.[37]

Some of the profits from the Crown Domain went to subsidize the Congo Independent State (700,000 francs in 1900), but Leopold funneled much of the revenue into his secretly established Crown Foundation, where it was used to purchase Belgian real estate and build lavish palaces and monuments. Cattier estimated that the value of the properties purchased by the king in Brussels and Ostende alone came to over 18 million francs. In addition, Crown Foundation funds were used to enlarge and remodel the king's palace at Laecken and to build the *Arcade de Cinquantenaire* in Brussels and the Museum in Tervuren. In all, Daniel Vangroenweghe estimates that 30 million francs from the profits of the Crown Domain were invested in real estate and construction in Belgium.[38]

The End of the Congo Independent State

The events leading to the Belgian takeover of the Congo Independent State are relatively well known thanks to books such as Adam Hochschilds' *King Leopold's Ghost*. A report by the British consul Roger Casement in 1904 first alerted the world to the atrocities in the Congo. It was followed by an official Commission of Inquiry in 1905 that confirmed most of Casement's claims. The Congo Reform Association, organized by E. D. Morel in England, galvanized international outrage through a constant barrage of meetings and publications. Despite Leopold's liberal use of money to keep friendly journalists on his payroll and to subsidize friendly publications, the international pressure was so great that in 1906 he was forced to enter into negotiations with the Belgian government for the transfer of control over the Congo.

The international pressure for reform was strong, and losing the Congo was certainly a blow to Leopold's dreams and pride, but the transfer of the Congo to Belgium may have been his most skillful financial maneuver of all. As the negotiations dragged on from 1906 to 1908, Leopold must have been aware that the rubber and ivory that had formed the financial base of the Congo Independent State were running out. The era of gaining quick wealth from pillaging the land was coming to an end. He would turn over to Belgium a landscape denuded of its most accessible resources.

Financially, Leopold had little to lose and a lot to gain by selling the Congo to Belgium. Between 1901 and 1907 he had transferred nearly 100 million francs to his Crown Foundation while putting the Congo Independent State deeply in debt. He did it by using the unissued Congo Independent State bonds to pay for his various projects in Belgium. Each time he used a bond to pay one of the entrepreneurs working for his Foundation, the debt of the Congo state increased.[39] In order to put his tangible wealth out of reach of the Belgian government when it took over the Congo (and out of the reach of his daughters when he died), Leopold created a new foundation in Germany, called the Niederfullbach Foundation. It contained at least 25 million francs of the king's personal fortune, about 20 million of which had come directly from the Congo. In addition the foundation became the owner of the royal jewels, paintings, sculptures, silver, and even the king's personal library.[40]

Portrait of Leopold in old age, ca. 1900–1909.

When Leopold first began negotiating with the Belgian government about the takeover of the Congo, he produced a codicil to his will, backdated to 1889, in which he reneged on his previous commitment to turn the Congo over to Belgium upon his death. He announced that he would cede the

Congo only on his own terms. When the negotiations finished in 1908, the Belgian government agreed to pay the king 50 million francs in compensation for the "great sacrifices" he had made for the Congo. It also agreed to spend more than 45 million francs to complete the king's favorite construction projects. In addition, the government agreed to assume the Congo Independent State's debt of nearly 110 million francs. Thirty-two million francs of that debt were the result of outstanding loans that Belgium had given to the Congo Independent State; much of the rest of it was in the form of unredeemed bonds that carried the words Etat Indépendant du Congo across the top.[41]

On December 13, 1909, with King Leopold ill and near death, he married his mistress Caroline, a former prostitute whom he had met in Paris, so that their two sons would become legitimate and so that she could be his legal heir. In the impromptu ceremony, Leopold wore his white flannel dressing gown and Caroline wore the black silk dress that she had worn to the theater the night before. Seeing Caroline in the black dress, Leopold told one of the witnesses, "Let me introduce you to my widow." At five o'clock the next morning, shortly before Leopold's risky operation to relieve an intestinal blockage, he sent Caroline six Congo trunks containing a fortune in Congo Independent State bonds. Only after receiving word that Caroline had received the bonds did he allow the operation to begin. The king survived the surgery but died three days later.[42] His last financial transaction was the transfer of those Congo Independent State bonds.

Notes

INTRODUCTION: FINANCIAL INNOVATIONS IN HISTORY

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CHAPTER 1. THE INVENTION OF INTEREST: SUMERIAN LOANS

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9. Stephen Simmons, *Early Old Babylonian Documents*, Yale Oriental Series 14 (New Haven: Yale University Press, 1987), no. 148.
10. E. M. Grice, *Records from Ur and Larsa dated in the Larsa Dynasty*, Yale Oriental Series 5 (New Haven: Yale University Press, 1919), no. 147.
11. Aaron Skaist, *The Old Babylonian Loan Contract. Its History and Geography* (Ramat Gan: Bar-Ilan University Press, 1994), 41–51.
12. Simmons, *Early Old Babylonian Documents*, no. 50.
13. For instance, in the case of Dumuzi-gamil's five-year loan, discussed on p. 26.
14. Aristotle, Politics, Book I 1258b1, in Stephen Everson, *Aristotle. The Politics and The Constitution of Athens* (Cambridge: Cambridge University Press, 1996), 25.
15. Piotr Steinkeller, "The Renting of Fields in Early Mesopotamia and the Development of the Concept of 'Interest' in Sumerian," *Journal of the Economic and Social History of the Orient* 24 (1981): 113–45.
16. Martha T. Roth, *Law Collections from Mesopotamia and Asia Minor*, 2d ed. (Atlanta: Scholars Press, 1997), 61 ¶ 18A.
17. Roth, *Law Collections from Mesopotamia and Asia Minor*, 2d ed., 97 ¶ t.
18. Skaist, *The Old Babylonian Loan Contract*, 116
19. Skaist, *The Old Babylonian Loan Contract*, 108–9.
20. Michael Jursa, "Debt and Indebtedness in the Neo-Babylonian Period: Evidence from the Institutional Archives," in *Debt and Economic Renewal in the Ancient Near East*, ed. M. Hudson and M. Van De Mieroop (Bethesda, Md.: CDL Press, 2002), 198.
21. Michael Hudson, "How interest rates were set, 2500 B.C.–1000 A.D.," *Journal of the Economic and Social History of the Orient* 43 (2000): 132–61.
22. W.F. Leemans, "The Rate of Interest in Old-Babylonian Times," *Revue Internationale des Droits de l'Antiquité* 5 (1950): 30.
23. Maria deJ. Ellis, *Agriculture and the State in Ancient Mesopotamia* (Philadelphia: Occasional Publications of the Babylonian Fund, 1976), 167.
24. Skaist, *The Old Babylonian Loan Contract*, 138–39.
25. Skaist, *The Old Babylonian Loan Contract*, 190–91.
26. Skaist, *The Old Babylonian Loan Contract*, 104–18.
27. Skaist, *The Old Babylonian Loan Contract*, 124–27.
28. The exact reading of this name is not certain, so modern scholars write out the doubtful parts in capital letters.
29. Steven J. Garfinkle, *Private Enterprise in Babylonia at the End of the Third Millennium B.C.* (Ann Arbor, Mich.: University Microfilms, 2000), 56–57.
30. Marc Van De Mieroop, *Society and Enterprise in Old Babylonian Ur* (Berlin: Dietrich Reimer Verlag, 1992), 132–36.
31. H.H. Figulla and W.J. Martin, *Letters and Documents of the Old Babylonian Period*, vol. 5 of Ur Excavations. Texts. (London and Philadelphia: The British Museum and the University Museum, University of Pennsylvania, 1953), no. 361.
32. Figulla and Martin, *Letters and Documents of the Old Babylonian Period*, no. 126.
33. Rivkah Harris, "Old Babylonian Temple Loans," *Journal of Cuneiform Studies* 14 (1960): 126–37.
34. Skaist, *The Old Babylonian Loan Contract*, 127–29.
35. Skaist, *The Old Babylonian Loan Contract*, 172–80.
36. Samuel I. Feigin, *Legal and Administrative Texts of the Reign of Samsu-iluna*, Yale Oriental Series 12 (New Haven: Yale University Press, 1979), nos. 451 and 450, respectively.
37. David I. Owen, *Neo-Sumerian Archival Texts primarily from Nippur* (Winona Lake: Eisenbrauns, 1982), no. 397; Piotr Steinkeller, "'The Ur III Period," in *Security for Debt in Ancient Near Eastern Law*, ed. R. Jasnow and R. Westbrook (Leiden: Brill, 2001), 57.
38. Piotr Steinkeller, "Money-Lending Practices in Ur III Babylonia: The Issue of Economic Motivation," in *Debt and Economic Renewal in the Ancient Near East*, ed. M. Hudson and M. Van De Mieroop (Bethesda, Md.: CDL Press, 2002), 109–37.
39. Marc Van De Mieroop, "The Archive of Balmunamhe," *Archiv für Orientforschung* 34 (1987): 11–12.
40. Translated by J.J. Finkelstein, "The Edict of Ammisaduqa," in *Ancient Near Eastern Texts Relating to the Old Testament*, 3d ed., ed. J.B. Pritchard (Princeton: Princeton University Press, 1969), 528 § 20.
41. Marc Van De Mieroop, "Old Babylonian Interest Rates: Were They Annual," *Immigration and*

Emigration within the Near East. Festschrift E. Lipinski, Orientalia Lovaniensia Analecta 65 (Louvain: Departement Oriëntalistiek, 1995), 357–64.

42. Dietz Otto Edzard, *Altbabylonische Rechts- und Wirtschaftsurkunden aus Tell ed-Der im Iraq Museum, Baghdad* (Munich: Verlag der bayerischen Akademie der Wissenschaften, 1970), 42 note 1.
43. Henry F. Lutz, *Legal and Economic Documents from Ashjâli*, University of California Publications in Semitic Philology, vol. 10, no. 1 (Berkeley: University of California, 1931), no. 8.
44. Recently, an article appeared arguing against my suggestion that interests were not charged *per annum*. I fail to be convinced by the arguments made there, which basically boil down to two: the Babylonians could easily calculate a fraction of the interest, and it would be economically impossible to charge such high rates. The first argument is irrelevant, the second merely an assumption based on modern prejudices. See Peter Vargyas, "Babylonian Interest Rates: Weren't They Annual?" in *Studi sul vicino oriente antico dedicati alla memoria di Luigi Cagni*, ed. S. Graziani (Naples: Istituto Universitario Orientale, 2000), 1095–1105.
45. Sidney Homer and R. Sylla, *A History of Interest Rates*, 3d ed. (New Brunswick and London: Rutgers University Press, 1991), 428–29.
46. Lutz, *Legal and Economic Documents from Ashjâli*, no. 8.
47. Jerrold S. Cooper, *Sumerian and Akkadian Royal Inscriptions* I (New Haven: The American Oriental Society, 1986), 55.
48. If we take the numbers given literally the accrual would amount to 4,478,976,000,000 liters. See Marvin Powell, "Masse und Gewichte," in *Reallexikon der Assyriologie*, vol. 7, ed. D.O. Edzard (Berlin and New York: Walter de Gruyter, 1987–1990), 497. In "The Renting of Fields in Early Mesopotamia," 144 note 85, Steinkeller tried to reduce that number substantially, but I am not convinced that this needs to be done.

    Enmetena wanted to express that the amount of grain owed was gigantic. To get some idea of its magnitude, one can compare it to the total quantity of grain produced in one year on all institutional lands in the province of Lagash a few centuries later, 37,210,500 liters. See Marc Van De Mieroop, *Cuneiform Texts and the Writing of History* (London and New York: Routledge, 1999), 132.
49. Mathematical problem texts from the early second millennium, used as teaching tools in the scribal education, also hint at the concept of compound interest. They stated an amount of barley, for example, and asked how long it would take to accrue. These were not practical problems, however, but games that asked the student to display complex mathematical skills. Their relevance for the reconstruction of actual accounting practices is thus minor. See Van De Mieroop, "Old Babylonian Interest Rates: Were They Annual," 360–61.
50. Edward Bleiberg, "Loans, Credit, and Interest in Ancient Egypt," in *Debt and Economic Renewal in the Ancient Near East*, ed. M. Hudson and M. Van De Mieroop (Bethesda, Md.: CDL Press, 2002), 257–76.
51. Michael Hudson, "Did the Phoenicians Introduce the Idea of Interest to Greece and Italy—and If So, When?" in *Greece between East and West: 10th–8th Centuries* B.C., ed. G. Kopcke and I. Tokumaru (Mainz: Philipp von Zabern, 1992), 128–43.
52. Paul Millett, *Lending and Borrowing in Ancient Athens* (Cambridge: Cambridge University Press, 1991), 105.
53. Christian Gizeski, "Centisima," in *Der Neue Pauly*, ed. H. Cancik and H. Schneider (Stuttgart: J. B. Metzler, 1997), 1060–61.

CHAPTER 2. ROMAN SHARES

1. John Micklethwait and Adrian Woolridge, *The Company: A Short History of a Revolutionary Idea* (New York: Modern Library, 2003), 18, point to equity offerings of mines, mills, and shipping companies in the thirteenth century.
2. Micklethwait and Woolridge, *The Company*, 23. Other historians only recognize the joint-stock companies of late seventeenth- and eighteenth-century England as the first business corporations. See Nathan Rosenberg and Luther Earle Birdzell Jr., *How the West Grew Rich: The Economic Transformation of the Industrial World* (New York: Basic Books, 1986), 195; and Philip Lawson, *The East India Company: A History* (New York: Longman Publishing Group, 1993), 21. Also note that the very first records of an English joint stock company date back even to the sixteenth century (Muskovy Company, created in 1553–1555). See Fernand Braudel, *Civilization and Capitalism, Fifteenth–Eighteenth Century, vol. 2, The Wheels of Commerce* (New York: HarperCollins, 1982), 439.
3. Dionysius of Halicarnassus, *Antiquities of Rome*, (6,17,2): καὶ ναῶν κατασκευὰς ἐξεμίσθωσε Δήμητρι καὶ Διονύσῳ καὶ Κόρῃ. Demeter, Dionysus, and Kore equate, respectively, with the Roman deities Ceres, Liber, and Liberia. The credibility of this earliest report suffers somewhat from

the mention of three ναοί since only one was built by the Romans. See Earnest Cary, *The Roman Antiquities of Dionysius of Halicarnassus*, vol. 3 (London and Cambridge, Mass., 1953), 291, note 1.

4. See Ernst Badian, *Zöllner und Sünder* (Darmstadt, 1997), 8.
5. Livy, 5, 47, 4.
6. The office of the *censor* dealt with determining the tax status of citizens and drawing up the roll of citizens, similar to a modern census. Pliny, Nat. Hist. 10, 26, 51: *cibaria anserum censores in primis locant.*
7. Livy, *Ab Urbe Condita* 23, 48, 10–49, 4: *tres societates . . . hominum undeviginti ad conducendum . . . aderant.*
8. Livy, 24, 18, 10 f.: *Cum censores ob inopiam aerarii se iam locationibus abstinerint aedium sacrarum tuendarum curuliumque equorum praebendorum ac similium his rerum, convenire ad eos frequentes qui hastae huius generis adsueverant, hortarique censores ut omnia perinde agerent locarent ac si pecunia in aerario esset: neminem nisi bello confecto pecuniam ab aerario petiturum esse.*
9. See Conrad Gottfried Dietrich, *Beiträge zur Kenntniss des römischen Staatpächtersystems* (Leipzig, 1877), 20ff., and Die rechtlichen Grundlagen der Genossenschaften der römischen Staatspächter, I. Die rechtliche Natur der societas publicanorum, in *Jahresbericht der Fürsten-und Landesschule St. Afra in Meissen vom Juli 1888 bis Juli 1889* (Meissen, 1889), 2; and Georg Ürödgi, Publicani, *Real-Encyclopädie* Suppl. 11, Sp. 1184-1208, (Stuttgart, 1968), col. 1186 ff.
10. Livy (42, 3, 1–11; 45, 15, 9): *opera publica facienda et sarta tecta tuenda locare.*
11. This translation derives *sarta* from *sarcire* as an attributive to *tecta*. *Sarta* may also be a noun or predicative, without changing the meaning. For an overview of the literature see Andrea Trisciuoglio, "Sarta tecta, ultrotributa, opus publicum faciendum locare," Sugli appalti relativi alle opere pubbliche nell'età repubblicana e augustea, Memorie del dipartimento di scienza giuridiche, Università die Torino, Serie V, Memoria VII, (Neapel, 1998), 7–12.
12. Val. Max. 5, 6, 8; Livy, 23, 48, 5–49, 4, 25, 3, 10 and 34, 6, 13 for the years 216–215 B.C.; 27; 10, 13 for the year 209 B.C.; 44, 16, 4 for the year 169 B.C.
13. Examples are in Livy, 25, 3, 9 and Valerius Maximus, 5, 6, 8 (construction and management of public buildings); Cic., *Sec. in Verr.* 1, 49, 128 (temples); Dionys. of Hal., *Ant. Rom.* 3, 67 (public sewers); Livy, 4, 22, 7 (construction of *villa publica*); 5, 23, 7 (temple to Mater Matuta in the Forum Boarium and temple of the Iuno Regina on the Aventin); 6, 32, 1 (city walls); 24, 18, 10 (temple upkeep); 29, 37, 2 (on street surface repairs; also 41, 27, 5); 40, 51, 3–5 (on the renovation of the *fora* and the theatres); and numerous additional references in Ürödgi, Publicani, col. 1186 f. Badian, Zöllner und Sünder, 8, supports the credibility of these descriptions in spite of Livy's tendency toward embellishment.
14. Comp. Francesco Milazzo, La realizzazione delle opere pubbliche in Roma arcaica e repubblicana. Munera e ultro tributa. *Pubblicazioni della Facoltàdi Giurisprudenza di Catanzaro (Università degli Studi di Reggio Calabria) Nr. 23* (Neapel, 1993), 147 ff.
15. Varro, *De Ling. Lat.* 4, 92, and also Badian, Zöllner und Sünder, 8 f.
16. Both the ground of the *ager publicus* and its *vectigalia* appear to have been leased out. See Cicero, *Sec. in. Verr.* 3, 6, 13, where he seems to refer not to the property lease of the *ager publicus* in Sicily, but to the *vectigalia*. Comp. Helen Jefferson Loane, "Industry and Commerce in the City of Rome (50 B.C.–200 A.D.)," The Johns Hopkins University Studies in Historical and Political Science Series 56, no. 2, (Baltimore, 1938), 100.
17. Pliny, *Nat. Hist.*, 33, 37, 114.
18. See Cicero (*De Leg. Agr.* 2, 36) and Festus (P. 121 M = P. 08 L). The *lacus lacrinus* was taken by Rome during the second Punic War. According to Servius in his comments on the *Georgica* 2, 36, the rich yields in fish declined due to sedimentary fill and only recovered when Caesar gave in to the *publicani*'s urging and built dams to restore the prior condition of the lake.
19. Evidence in Ürödgi, Publicani, col. 1188 ff.
20. Roman citizens did not have to pay such direct taxes.
21. Cicero, *De Imp. Cn. Pomp.* 6, 15.
22. Cicero, *Ad Att.* 2,16,2: *portoriis Italiae sublatis, agro Campano diviso, quod vectigal superest domesticum praeter vicesiman?*
23. Livy, 25, 3, 12; H. Hill, *The Roman Middle Class in the Republican Period* (Oxford, 1952), 55 ff.; and Ürödgi, Publicani, col. 1193 f.
24. The *Fragmentum Leidense* (see Studia Gaiana IV) reveals that the Senators and their "superiors" were also excluded from tax collection and from the delivery of horses for the games by the *lex Iulia repetundarum.*
25. Comp. Q. Cic., Comm., pet. 3: *habes . . . omnes publicanos, totum fere equestrem ordinem*, and 50: *studia publicanorum et equestris ordinis.*
26. Michail Rostovtzeff, *Geschichte der Staatspacht in der römischen Kaiserzeit bis Diokletian* (Leipzig, 1902), 382; and Theodor Mommsen, *Römische Geschichte*, 14th ed. (Berlin 1912), vol. 2, 380–384.

27. According to Appian, *Bell. Civ.* 4, 5, two thousand knights were killed as a result of the proscriptions. See also the detailed account of the brutality of the proscriptions in Cass. Dio 47, 14.
28. Maria Rosa Cimma, *Ricerche sulle Societàdi Publicani* (Mailand, 1981), 99 ff.; Otto Hirschfeld, *Die kaiserlichen Verwaltungsbeamten bis auf Diokletian*, 3d ed. (Berlin, 1963), 69 ff.; and Rostovtzeff, *Geschichte der Staatspacht in der römischen Kaiserzeit bis Diokletian*, 379.
29. See Joachim Marquart, *Römische Staatsverwaltung* vols. 1–3, 2d ed. (Leipzig, 1884), 301–18; and Ürödgi, Publicani, col. 1200, 1202. Augustus established the concept of "imperial" and "senatorial" provinces in 27 B.C. In the imperial provinces, the emperor himself was formally the provincial governor; he appointed former consuls or praetors to administer those provinces.
30. Plin., Ep. 7, 14; *Panaeg.* 37, 7; 39, 5. See also Siegfried J. De Laet, *Portorium. Études sur l'organisation douanière chez les Romains, surtout à l'époque du Haut-Empire* (Brügge, 1949), 383, on the allocation of portoria collection to smaller *conductores*, i.e. "minor contractors"; and Ürödgi, Publicani, col. 1202.
31. Gaius 4, 32; Tac., *Ann.* 13, 51; Quint., *Decl.* 359. See also Georg Klingenberg, *Commissum. Der Verfall nichtdeklarierter Sachen im römischen Zollrecht* (Graz, 1977), 97; and P.W. Duff, *Personality in Roman Private Law* (Cambridge, 1938), 159.
32. The *Corpus Iuris Civilis* is by far the most important written source of Roman law. In the sixth century A.D., the Eastern Roman Emperor, Justinian, ordered the compilation of several law codes, mostly based on statutes and legal writings from the classical period. Part 1, the Institutes (*Institutiones*), is a beginners' textbook, largely copied from the Institutes of Gaius, which were written 300 years prior. Part 2, the Digest (*Digesta* or *Pandectae*), is a collection of fragments from scholarly writings. Part 3, the Code (*Codex*), is a collection of imperial statutes. Justinian had planned to add another collection to these three: new pieces of legislation (*novellae constitutiones*) that had been adopted after the compilation of the Code. This plan was never realized. Today, we have only private collections of these *novellae constitutiones*. The *Corpus Iuris Civilis* constituted the basis of the revival of Roman law in the Middle Ages. Numerous rules from the Institutes and the Digest are incorporated in laws in force today in countries all over the world.
33. Ulpian D. 39, 4, 12, 3 (38 *ad ed.*): *Publicani autem dicuntur, qui publica vectigalia habent conducta* ("*Publicani* is the name for those who collect public taxes."); similar Gaius D. 50, 16, 16, 3 (3 *ad ed. provinc.*); for more examples see Ulrike Malmendier, *Societas publicanorum* (Cologne and Vienna, 2002), 25.
34. Pomponius, D. 17, 2, 59 *pr.* (12 *ad Sab.*): *in societate vectigalium nihilo minus manet societas et post mortem alicuius*; Gaius, in D. 3, 4, 1 *pr.* (3 *ad ed. provinc.*): *ut ecce vectigalium publicorum sociis permissum est corpus habere*. See also Ulpian, D. 17, 2, 5 *pr.* (31 *ad ed.*): *societas contrahuntur sive universorum bonorum sive negotiationis alicuius sive vectigalis sive etiam rei unius*; Ulpian, 63, 8 (31 *ad ed.*): *Et circa societas vectigalium ceterorumque idem observamus, ut heres socius non sit nisi fuerit adscitus*; Paulus, D. 17, 2, 65, 15 (32 *ad ed.*): *Nonnumquam necessarium est et manete societate agi pro socio, veluti cum societas vectigalium causa coita est.*
35. Huber, in Helmut Engelmann and Dieter Knibbe, Das Zollgesetz der Provinz Asia. Eine neue Inschrift aus Ephesos, *Epigraphica Anatolica* 14 (1989), 1; and Engelmann and Knibbe, 6.
36. Dietrich, *Beiträge zur Kenntniss des römischen Staatpächtersystems*, 62.
37. Engelmann and Knibbe, Das Zollgesetz der Provinz Asia, 95 f. and 160, date the core of this inscription to 75 B.C. based on the leases mentioned in paragraphs 31 and 33, which were given out by the consuls of that year, L. Octavius and C. Aurelius Cotta.
38. They are prefaced by the standard Roman legal formula οἱ ὕπατοι προσέθηκαν (*"consules addiderunt"*).
39. Paragraph 2: κατὰ δόγμα συγκλήτου ἢ κατὰ νόμον [ἢ κατὰ δήμου κύρωσιν συγκεχώρηται ἐπιτέτραπτ]αί τε τελωνείαν ἐκμισθῶσαι.
40. Paragraph 32: ἐξ Ἀσίας εἰς Ἀσίαν [ὃ ἂν ἐξάγηται, εἰσά] γηται, . . . ὑπὲρ τούτου τὲλος μὴ διδόσθω{ι}.
41. Paragraph 31: οὗ πράγματος δεκάτας καρπῶν ἀροτῆρσι ποριζομένων ἢ ι΄ μέρος οἴνου καὶ ἐλαίου τῶι δημοσιώνη δίδοσθαι [δεῖ δήμου Ῥωμα]ίων ἕνεκεν, τούτων δημοσιώνην καρπεύεσθαι τὸ τέλος ὡς ἐξεμίσθωσαν Λούκιος Ὀκτάουιος, Γάιος Αὐρήλιος Κόττας ὕπατοι.
42. Paragraph 42: [ὁ δ]ημοσιώνης ὁ παρὰ τοῦ δήμου τὴν τῶν τελῶν ἀνάπραξιν ἐργολαβήσας, ὧι ἂν ἔτει καρπεύεσθαι δέξηται, εἰδοῖς Ὀκτωβρίαις δευτέραις [τῶι τοῦ Κρόνου αἰραρί]ωι διευλυτεῖν ὀφειλέτω, ... Literally, the *lex* says that the publican shall pay on the Ides of October of the next year (Ὀκτωβρίαις δευτέραις) to make clear that it is the year after the conclusion of the contract. The contracting took place before October, typically on the Ides of March; see Engelmann and Knibbe, Das Zollgesetz der Provinz Asia, 112.
43. Paragraph 43: δημοσιώ[νης . . .] . . . πραισὶ καὶ ἐνγαίοις δημοσίᾳ διικανοδοτείτω.
44. See Peter Astbury Brunt, "The Equites in the Late Republic," in *The Crisis of the Roman Republic:*

Studies in Political and Social History, ed. Robin Seager (Cambridge, 1969), 91; Keith Hopkins, *Conquerors and Slaves, Sociological Studies in Roman History* vol. 1 (Cambridge, 1973), S. 53; and Claude Nicolet, "Réflexions sur les Sociétés de Publicains: Deux Remarques sur l'Organisation des Sociétés de Publicains à la Fin de la République Romaine," in *Points de Vue sur la Fiscalité Antique*, ed. Henri van Effenterre, vol. 14, (Paris: Publications de la Sorbonne, 1979), 71.

45. Duff, *Personality in Roman Private Law*, 95 ff.
46. Paulus, D. 17, 2, 3, 3, and Ulpian (Pomponius) D. 17, 2, 57.
47. A partner (*socius*) had to contribute either property or labor; Gaius, 3, 149 ff.
48. Livy, 23, 48, 10–49.
49. Ulpian, 31 *ad edictum*, D. 17, 2, 5 *pr.*: *Societates contrahuntur sive universorum bonorum sive negotiationis alicuius sive vectigalis sive etiam rei unius.*
50. Gaius 3, 152; Paulus D. 17, 2, 65 *pr.*
51. D. 17, 2, 65, 9 and Inst. 3, 25, 5; Gai. 3, 152 ff. The heirs could find a new association, comp. Pomponius D. 17, 2, 37 (13 *ad Sabinum*): *Plane si hi, qui sociis heredes exstiterint, animum inierint societatis in ea hereditate, novo consensu quod postea gesserint efficitur ut in pro socio actionem deducatur.*
52. Institutiones 3, 252; Ulpian D. 17, 2, 30.
53. Pomponius, in the twelfth book of ad Sabinum (D. 17, 2, 59 *pr.*): *Adeo morte socii solvitur societas, ut nec ab initio pacisci possimus, ut heres etiam succedat societati. Haec ita in privatis societatibus ait: in societate vectigalium nihilo minus manet societas et post mortem alicuius, sed ita demum, si pars defuncti ad personam heredis eius adscripta sit, ut heredi quoque conferri oporteat; quod ipsum ex causa aestimandum est. quid enim, si is mortuus sit, propter cuius operam maxime societas coita sit aut sine quo societas administrari non possit?*
54. For example, see Ulpian, 31 *ad edictum*, D. 17, 2, 63, 8.
55. Festus, p. 151 M = p. 137 L, s.v. *manceps*: *Manceps dicitur, qui quid a populo emit conducitve, quia manu sublata significat se auctorem emptionis esse.*
56. Cic., *Pro Planc.* 13, 32 on Plancius: *princeps inter suos . . . maximarum societatum auctor* and Ps.-Asc., *Caec. Div.* 33: *mancipes sunt publicanorum principes.*
57. Paragraph 46: Ἐν ἡμέραις εἴκοσι ταῖς ἔγγιστα τὸν αὐθέντη[ν ἀλλάξαι ἔξεσται. The proper translation for *manceps* is ἀρχώνης, not αὐθέντης; comp. Rostovtzeff, Geschichte der Staatspacht in der römischen Kaiserzeit bis Diokletian, 368. The slight misuse of terminology (αὐθέντης means *magister*) is an example of the general lack of translation skill in this Greek version of the *lex portorii Asiae*; see Englemann and Knippe, Das Zollgesetz der Provinz Asia, 6.
58. Paragraph 54: τὸν αὐθέντην ἐπὶ τῶν ἑκάστου ἔτους ἐσομένων στρατηγῶν ἐξεῖναι ἀλλά[ξαι.
59. Paulus 32 *ad edictum* (D. 17, 2, 65, 15): *Nonnumquam necessarium est et manente societate agi pro socio, veluti cum societas vectigalium causa coita est propterque varios contractus neutri expediat recedere a societate.*
60. Gaius, D. 3,4,1,1: *Quibus autem permissum est corpus habere collegii societatis sive cuiusque alterius eorum nomine, proprium est . . . habere . . . actorem sive syndicum, per quem tamquam in re publica, quod communiter agi fierique oporteat, agatur fiat.*
61. Gaius, D. 3,4,1 *pr.*: *vectigalium publicorum sociis permissum est corpus habere.*
62. Cicero, pro lege Manila 2, 6.
63. Ps.-Asc. *In Verr. Sec.* 1, 55, 143 (Th. Stangl, 253, 7–8).
64. Plutarch, *Trin.* 330–331: *Qui eam perdidit? Publicisne adfinis fuit an maritumis negotiis?* Livius 43,16,2: *In ea re cum equestrem ordinem offendissent, flammam invidiae adiecere edicto, quo edixerunt, ne quis eorum qui Q. Fulvio A. Postumio censoribus publica vectigalia aut ultro tributa conduxissent ad hastam suam accederet sociusve aut adfinis eius conductionis.*
65. Cicero, *Pro Rab. Post.* 2, 4.
66. Valerius Maximus, 6, 9, 7.
67. Cicero, *Sec. in Verr.* 1, 55, 143.
68. See Michail Rostovtzeff, *The Social and Economic History of the Roman Empire* (New York: Oxford University Press, 1957), 31.
69. Duff, *Personality in Roman Private Law*, 159.
70. Cicero, *P. Vat.* 12, 29.
71. Rostovtzeff, *Geschichte der Staatspacht in der römischen Kaiserzeit bis Diokletian*, 372; and Reinhard Zimmermann, *The Law of Obligations: Roman Foundations of the Civilian Tradition* (Oxford, 1996), 468: "it was even possible for outsiders to invest capital in the *societas* by purchasing share certificates which circulated on the financial markets."
72. Polybius, 6, 17, 3: σχεδὸν ὡς ἔπος εἰπεῖν πάντας ἐνδεδέσθαι ταῖς ὠναῖς.
73. Polybius, 6, 17, 4: οἱ μὲν γὰρ ἀγοράζουσι παρὰ τῶν τιμητῶν αὐτοὶ τὰς ἐκδόσεις, οἱ δὲ κοινωνοῦσι τούτοις, οἱ δ᾽ ἐγγυῶνται τοὺς ἡγορακότας, οἱ δὲ τὰς οὐσίας διδόασι περὶ τούτων εἰς τὸ δημόσιον. It is unclear to whom Polybius refers with the last two categories, οἱ δ᾽ἐγγυῶνται τοὺς ἡγορακότας, οἱ δὲ τὰς οὐσίας διδόασιν ὑπὲρ τούτων εἰς τὸ δημόσιαν, praedes ("sureties" as in the

translation above), as Antonin Deloume argues in *Les Manieurs d'Argent à Rome: Les Grandes Compagnies par Actions, le Marché, Puissance des Publicains et des Banquiers jusqu'à L'empire, Étude historique* (Paris, 1890), 120, or *participes* ("shareholders"), as argued by Ferdinand Kniep, Societas Publicanorum vol. 1 (Jena, 1896), 204, and Paul Viard, Le Praes (Dijon, 1907), 105.

74. Cic., *Pro Lege Man.* 2, 6: *aguntur bona multorum civium.*
75. Gaius, D. 3, 4, 1, 1.
76. Cicero, *Ad Fam.* 13, 9, 2: *constat ex ceteris societatibus.*
77. D. 47, 2, 31, 2.
78. D. 3, 4, 1: *habere res communes.*
79. D. 37, 1, 3, 4: was entitled to the *bonorum possessio.*
80. D. 46, 1, 22.
81. Edicts were the civil law created by Rome jurisdictional magistrates, in particular by the praetors. They mainly concerned causes of actions and remedies against actions.
82. Both the content and the record of proceedings of the edict *quod cuiuscumque universitatis nomine vel contra eam agatur* (D. 3,4) are tailored toward the *collegium*, not the *societas publicanorum*. See Otto Lenel, *Das Edictum Perpetuum. Ein Versuch zu seiner Wiederherstellung*, 3rd ed., (Leipzig, 1927), 101; and Basil Eliachevitch, La personnalité juridique en droit privé romain, (Paris, 1942), 324.
83. Livius (43, 16, 2) mentions *adfines*, "shareholders," with respect to 169 B.C.
84. D. 3, 4: *Quod cuiuscumque universitatis nomine vel contra eam agatur*, and D. 47, 22: *De collegiis et corporibus.*
85. Herbert Felix Jolowicz, *Roman Foundations of Modern Law* (Oxford, 1957), 129, note 2 on D. 3, 4, 1 *pr.* versus D. 3, 4, 1, 3.
86. For a more detailed discussion, see Malmendier, *Societas publicanorum.*

CHAPTER 3. HOW BUSINESS WAS CONDUCTED ON THE CHINESE SILK ROAD DURING THE TANG DYNASTY, 618–907

Part I: The Resolution of an International Dispute on the Silk Road, ca. 670

1. The Greeks called the Iranian prophet Zarathustra Zoroaster, the name we use in modern English.
2. Stanley Insler, *The Gāthās of Zarathustra* (Leiden: E.J. Brill, 1975).
3. Three Sogdian-language contracts were found at the site of Mount Mugh: a marriage contract dated 710, a contract for the rental of a mill, and one for the sale of a plot of land. They have been published in a Russian edition, which gives a Sogdian transcription and the Russian translation. Vladimir A. Livshits, *Iuridicheskie dokumenty i pis'ma. Sogdiiskie dokumenty s gory Mug* 2 (Legal documents and letters). Sogdian Documents from Mount Mugh 2 (Moscow: Izdatel'ctvo Vostochnoi Literatury, 1962) 21–26, 47–48, 56–58. The only English-language study is Ilya Gershevitch, "The Sogdian Word for 'Advice,' and some Mugh Documents," *Central Asiatic Journal* 7 (1962): 77–95.

   A single contract dated 639 for the sale of a slave girl was found at Astana. A full scholarly transcription of this contract has been published by Yutaka Yoshida, Takao Moriyasu, Xinjiang Uighur Autonomous Museum. "Kikusei Kōshōkoku jidai Sogudobun jo dorei baibai monjo." *Nairiku Ajia gengo no kenkyū* 4 (1988): 1–50. For Professor Yoshida's translation of the contract, see Yoshida Yutaka, "Appendix Translation of the Contract for the Purchase of a Slave Girl Found at Turfan and Dated 639," *T'oung Pao* LXXXIX (2003):159–161.
4. Anahit Perikhanian, *Farraxvmart ī Vahrāmān The Book of a Thousand Judgements (A Sasanian Law-Book)* (New York: Mazda Publishers in association with Bibliotheca Persica, 1997).
5. Jamsheed K. Choksy, "Loan and Sales Contracts in Ancient and Early Medieval Iran," *Indo-Iranian Journal* 31 (1988): 192.
6. Choksy, "Loan and Sales Contracts," 193.
7. See note 1, above.
8. Aurel Stein, *Innermost Asia: Detailed Report of Explorations in Central Asia, Kan-su, and Eastern Iran* (Oxford: The Clarendon Press, 1928), 646.
9. Valerie Hansen, "Introduction: Turfan as a Silk Road Community," *Asia Major* Third Series XI.2 (1998): 1–6; Zhang Guangda and Rong Xinjiang, "A Concise History of the Turfan Oasis and Its Exploration," *Asia Major* Third Series XI.2 (1998): 13–36.
10. Jonathan Bloom, *Paper Before Print: The History and Impact of Paper in the Islamic World* (New Haven: Yale University Press, 2001); Tsien Tsuen-hsuin, *Science and Civilisation in China*, vol. 5, *Chemistry and Chemical Technology Part I: Paper and Printing* (New York: Cambridge University Press, 1985).
11. Chinese archeologists have yet to publish a detailed site report of the Astana excavations, which were conducted from 1959 to 1975 and overlapped with the tumultuous years of the Cultural Revolution.
12. Xinjiang Weiwuer zizhiqu bowuguan and Wuhan daxue lishi xi, eds., *Tulufan chutu wenshu* (Excavated documents from Turfan), vols. 1–4 (Beijing: Wenwu chubanshe, 1992–1996), vol. 3: 242–247. These documents are the subject of one Chinese article: Huang Huixian, "Tang Xizhou

Gaochangxian shang Anxi duhufu diegao wei lu shang xun wen Cao Lushan su Li Shaojin" (An explication of the document entitled, Draft "Die" report from Gaochang sub-prefecture, Xizhou prefecture to Anxi Protectorate recording the testimony from both sides of those in the dispute in which Cao Lushan sued Li Shaojin, Tang dynasty). In Tang Zhangru, ed., *Dunhuang Tulufan wenshu chutan* (Wuhan: Wuhan daxue chubanshe, 1983), 344–363. The Japanese scholar Arakawa Masaharu has also studied this document in depth: "Tō teikoku to Sogudojin no kōeki katsudō (Sogdian trading activity with the Tang empire)," Tōyōshi kenkyū 56 (1997): 171–204, analysis of this document on pp. 185–92.

Huang explains that this is probably a draft of a document because it lacks the seal of the sub-prefecture, those testifying did not give their fingermarks, there are a few mistaken characters, and the opening lines appear to be from another document.

13. Wallace Johnson, *The T'ang Code*, vol. 1, *General Principles* (Princeton: Princeton University Press, 1979); *The T'ang Code*, vol. 2, *Specific Articles* (Princeton: Princeton University Press, 1997), 121–127.
14. Yoshida Yutaka of Kobe City University of Foreign Studies has published several preliminary studies of Sogdian names and their Chinese transliterations, all in Japanese. Professor Yoshida has graciously provided me with their English equivalents, personal communication, August 2003.
15. In 670, the Tibetans took Kuche, which had been the seat of the Anxi Protectorate General since 649. From 670 to 679, Turfan was the seat of the Anxi Protectorate. I concur with Huang that Cao's death probably occurred before the disturbances of 670. Anxi, which could refer to either Kuche or Turfan, is used inconsistently—perhaps because those taking down the deposition were describing events before the change in name? These places are shown in map 8 in Denis Twitchett and John K. Fairbank, *The Cambridge History of China*, vol. 3, *Sui and T'ang China, 589–906, Part I* (New York: Cambridge University Press, 1979), 281.
16. Valerie Hansen, *Negotiating Daily Life in Traditional China: How Ordinary People Used Contracts* (New Haven: Yale University Press, 1995), 6–7.
17. The titles of the contracts (but not the contracts themselves) have been translated into English. See the Table of Contents in Tatsuro Yamamoto and On Ikeda eds., *Tun-huang and Turfan Documents Concerning Social and Economic History* (Tokyo: The Toyo Bunko, 1987).
18. *Tulufan chutu wenshu* 3: 211; transcribed in Yamamoto and Ikeda, *Tun-huang and Turfan Documents*, contract #69.
19. Lien-sheng Yang, *Money and Credit in China: A Short History* (Cambridge: Harvard University Press, 1952), 95.
20. Hansen, *Negotiating Daily Life*, 35, 43.
21. Johnson, *The T'ang Code* vol. 2, 464–65.
22. See, for example, another document from tomb 61 in which the courts provided an interpreter for a servant girl who spoke Tocharian, a distinct Indo-European language spoken largely in Kuche. *Tulufan chutu wenshu* 3: 239.
23. Denis Twitchett, *Financial Administration Under the T'ang Dynasty* (New York: Cambridge University Press, 1970), 70–71, 294 n. 36.
24. Eric Trombert, "Textiles et tissus sur la Route de la soie: Eléments pour une géographie de la production et des échanges." In *La Serinde, terre d'échanges: Art, religion commerce du Ier au Xe siècle. XIVes Rencontres de l'Ecole du Louvre* (Paris: La Documentation française, 2000), 108.
25. Jonathan Karam Skaff, "Sasanian and Arab-Sasanian Silver Coins from Turfan: Their Relationship to International Trade and the Local Economy," *Asia Major* Third Series XI.2 (1998): 67–115.
26. Trombert, "Textiles et tissus," 108.
27. Trombert, "Textiles et tissus," 111, citing Pelliot document 3348 verso 2B.
28. Avner Greif, Paul Milgrom, and Barry R. Weingast, "Coordination, Commitment, and Enforcement: The Case of the Merchant Guild," *The Journal of Political Economy* 102.4 (1994): 745–76. The bibliography includes citations to Greif's earlier articles on related topics.
29. See, for example, Kathryn Bernhardt and Philip C. C. Huang eds., *Civil Law in Qing and Republican China* (Stanford: Stanford University Press, 1994).

Part II: Records from a Seventh-Century Pawnshop in China

30. See Part I of this chapter for a more general discussion of the Astana graveyard. Ana Mata-Fink wrote a paper about the pawn tickets for Valerie Hansen's lecture class, "The Silk Road," taught in fall 2002 at Yale. The translation of the tickets and the tables are Mata-Fink's; the introductory essay is by Hansen. The authors would like to thank Angela Sheng for checking their translation.

Photographs and transcriptions of the tickets have been published in Xinjiang Weiwuer zizhiqu bowuguan and Wuhan daxue lishi xi, eds. *Tulufan chutu wenshu* (Excavated documents from Turfan), vols. 1–4 (Beijing: Wenwu chubanshe, 1992–1996), vol. 2: 328–40. Because of the

difficult circumstances under which the Astana excavations were conducted, and the incomplete publication of all the data, we cannot be certain which figurines contained the tickets. The editors of the published photographs do not report that the pawnshop accounts came from a figurine, but Chen Guocan, the author of a fine article in Chinese about these documents, does. See Chen Guocan, "Cong Tulufan chutu de 'zhikuzhang' kan Tangdai de zhiku zhidu" (A look at the pawn shop system of the Tang based on excavated "pawn tickets" from Turfan), in *Dunhuang Tulufan wenshu chutan* (ed. the research group working on Wei, Jin, Nanbei chao, Sui, and Tang materials, History Department, Wuhan University) (Wuhan: Wuhan University Press, 1983), 316–43.

31. Given the pace of archeological excavation in recent years, the earliest example of anything is certain to be superseded.
32. "To prevent possible dispute at the time of redemption, depreciating adjectives were added freely to the description of the pledge." Lien-sheng Yang, *Money and Credit in China: A Short History* (Cambridge: Harvard University Press, 1952), 72. Professor Yang provides a succinct overview of Chinese pawnshops, pp. 71–75. For a longer study in English, see T. S. Whelan, *The Pawnshop in China* (Ann Arbor: Center for Chinese Studies, The University of Michigan, 1979), which abstracts Yang Zhanyu's *Zhongguo diandang ye* (Shanghai: The Commercial Press Ltd., 1929).
33. *Tang liudian* (Taibei: Wenhai chubanshe, 1962) 6:45b–46a; Chen, "Cong Tulufan," 333–34.
34. A digit is missing in borrower 18's age, so she could be anywhere between eleven and nineteen years old.
35. Deng Xiaonan, "Women in Turfan during the Sixth to Eighth Centuries: A Look at Their Activities Outside the Home," *Journal of Asian Studies* 58.1 (1999): 85–103.
36. Chen, "Cong Tulufan," 335.
37. It is also possible that the pawnshop account book was sent to Turfan and the figurines made there. Angela Sheng, personal communication, April 2002.
38. Chen Guocan suggests that two entries, both missing characters, can be reconstructed to say Shengdao quarter, which was a district in Changan. Chen, "Cong Tulufan," 328–31. The other place names mentioned in the accounts do not appear on reconstructed maps of Changan, but it seems likely that these are local place names.
39. Chen, "Cong Tulufan," 329.
40. Yang, "Buddhist Monasteries," 177, citing *Jiu Tangshu* (Beijing: Zhonghua shuju edition) 183: 4,740.
41. Lu You (1125–1200) appears to have been the first observer to link pawnshops with monasteries. See his *Lao xue'an biji* (Beijing: Zhonghua shuju, 1979) 6:73
42. Jacques Gernet, *Buddhism in Chinese Society: An Economic History from the Fifth to the Tenth Centuries*, trans. Franciscus Verellen (New York: Columbia University Press, 1995), 170.
43. Lien-sheng Yang, "Buddhist Monasteries and Four Money-Raising Institutions in Chinese History," *Harvard Journal of Asiatic Studies* 13 (1950): 174–91, at 177. The four institutions described in the article are "the pawnshop, the mutual financing association, the auction sale, and the sale of lottery tickets" (174).
44. Chiara Frugoni, *Books, Banks, Buttons and Other Inventions from the Middle Ages*, trans. William McCuaig (New York: Columbia University Press, 2003), 55–59.
45. Yang, *Money and Credit*, 74. He gives the example of someone who put up 1,000 taels of silver to buy rice, then pawned it, and used the new loan to buy even more rice. If one repeated the transaction several times, one could eventually obtain four or five thousand taels.

CHAPTER 4. THE ORIGINS OF PAPER MONEY IN CHINA

1. To give some sense of the scale of this amount, around this time the cost of the typical annual rice consumption of an able-bodied adult (692.6 liters) ranged between 9.5 and 14.6 *guan* in Sichuan large coin iron currency. The region's population in 1080 was 1.8 million households.
2. Some indirect evidence suggests that these privately issued *huizi* already existed in the Northern Song, but conclusive proof remains elusive.
3. The "Inaugural Treasure" (*yuanbao*) of this title referred to a Chinese standard silver ingot weighing 50 *liang* (1.88 kgs.), and thus alluded to the fact that the new sovereign currency was backed by silver bullion.

CHAPTER 5. PAYING IN PAPER: A GOVERNMENT VOUCHER FROM THE SOUTHERN SONG

We thank an anonymous collector for making the Lizhou certificate available to us for study. We thank Valerie Hansen and Paul J. Smith for their advice and suggestions. We thank participants in the 2003 Yale International Center for Finance Conference on Financial Innovation for their input.

1. Valerie Hansen, *The Open Empire: A History of China to 1600* (New York and London: W. W. Norton, 2000), 271.

2. Cai Minxing, trans., *A Compilation of Pictures of Ancient Chinese Money* (Beijing: The Inner Mongolian Numismatic Research Institute and the China Finance Publishing House, 1992).
3. Richard von Glahn, *Fountains of Fortune: Money and Monetary Policy in China, 1000–1700* (Berkeley: University of California Press, 1996).
4. This latter definition is of course of interest to the history of finance. A certificate representing a future obligation to make periodic payments is close to being a bond. Unfortunately, the dictionary provides no specific source or date for this definition.
5. See Richard von Glahn, "The Origins of Paper Money in China," chap. 4 in this book.
6. Cai, *A Compilation of Pictures of Ancient Chinese Money*, 4–5, figs.
7. Frances Wood, *Did Marco Polo Go to China* (Boulder, Colo.: Westview Press, 1995), 68, notes that the Franciscan friar and papal emissary William von Rubruck saw and described Mongolian paper money decades before Marco Polo.
8. See Reinhold Mueller, *The Venetian Money Market: Banks, Panics, and the Public Debt 1200–1500* (Baltimore: Johns Hopkins University Press, 1997), 292. Mueller studies a remarkable archive from the Datini family containing decades of money remittances and exchange notes.
9. For a detailed discussion, see Zhou Yumin, *Wan Qing caizheng yu shehui bianqian* (Fiscal policies of the late Qing and social transformation) (Shanghai: Shanghai renmin chubanshe, 2000), 120–233.
10. Yeh-chien Wang, "Secular Trends of Rice Prices in the Yangzi Delta, 1638–1935," in *Chinese History in Economic Perspective*, ed. Thomas G. Rawski and Lillian M. Li (University of California Press, 1992), 57.
11. Xinwei Peng, *A Monetary History of China*, trans. Edward H. Kaplan (Bellingham: Western Washington University Press, 1994), 330 ff.
12. Timothy Brook, *The Confusions of Pleasure: Commerce and Culture in Ming China* (Berkeley: University of California Press, 1998), 107–8.
13. Von Glahn, "The Origins of Paper Money in China," chapter 4 in this volume.
14. Fu Weiqun, *Shanghai qianzhuang piaotushi* (Shanghai shudian chubanshe, 2002), 34–35. For Turfan pawnshop receipts, see Valerie Hansen, *Negotiating Daily Life in Traditional China: How Ordinary People Used Contracts 600–1400* (New Haven: Yale University Press, 1995).
15. Elisabeth Köll, *From Cotton Mill to Business Empire: The Emergence of Regional Enterprises in Modern China* (Cambridge, Mass: Harvard East Asian Monographs, 2003).
16. We thank Puk Wing-kin for this information. The salt ticket from the Hongwu period can be found in Guo Zhengzhong, *Zhongguo yanyeshi: gudai bian* (The history of salt in China: the premodern period) (Beijing renmin chubanshe, 1997), 596–97.
17. See, for example, documents printed in Wan Guoding et al., *Jiangsu Wujin, Nantong tianfu diaocha baogao* (Survey of the land taxation in Wujin and Nantong in Jiangsu), 1934, n.p., reprinted in *Minguo shiliao congkan* (Collection of materials on the Republican period), vol. 14 (Taibei: Zhuanji wenxue chubanshe, 1971), 30–32 and front matter. Wang Shiqing, *Qingdai Taiwan shehui jingji* (Taiwan's economy and society during the Qing) (Taibei: Lianjing, 1994), 215.
18. Simon Go, *Hong Kong Apothecary: A Visual History of Chinese Medicine Packaging* (New York: Princeton Architectural Press, 2003), 138–39.
19. http://artworld.scva.uea.ac.uk/objects/183/images/1379/details.html. See photo p. 99 in this volume.
20. We thank Valerie Hansen for this suggestion.
21. For an engaging historical overview see Hansen, *The Open Empire*, 261–97.
22. The short-lived period between 907 and 960, called the Five Dynasties, separated the Tang and Song.
23. Paul J. Smith, *Taxing Heaven's Storehouse: Horses, Bureaucrats and the Destruction of the Sichuan Tea Industry, 1074–1224*, Council on East Asian Studies (Cambridge: Harvard University Press, 1991), 114.
24. Smith, *Taxing Heaven's Storehouse*, 113, quoting from Li Tao.
25. Xinwei Peng, *A Monetary History of China*, 447.
26. Xinwei Peng, *A Monetary History of China*, 412.

CHAPTER 6. FROM TALLIES AND CHIROGRAPHS TO FRANKLIN'S PRINTING PRESS AT PASSY: THE EVOLUTION OF THE TECHNOLOGY OF FINANCIAL CLAIMS

1. Harry Rothwell, *English Historical Documents, 1189–1327*, vol. III (New York: Routledge, 1996), 465. On the term "tallage," see *The American Heritage Dictionary of the English Language*, 4th ed., 2000. Tallage comes from the Old French term *taillier* (to cut, to tax). This suggests that, while no stocks and foils have survived from medieval France, tax obligations on the continent may have been recorded in the same manner—through cuts on a stick. Perhaps the practice, along with the word, was introduced by the Normans in 1066, or perhaps it was widespread on both sides of the Channel and we simply have no earlier extant record of it.

2. *History of the County of Oxford*, v. XII, ed. Alan Crossley (Victoria County History of the Counties of England, 1990).
3. Karl Menninger, *Number Words and Number Symbols: A Cultural History of Numbers*, rev. ed., tr. Paul Broneer (New York: Dover Publications, Inc., 1992), 237.
4. W.T. Baxter, "Early Accounting: The Tally and the Checkerboard," *The Accounting Historians Journal* 16.2 (Dec. 1989): 53–55.
5. Baxter, "Early Accounting," 53.
6. Baxter, "Early Accounting," 81–82. M.T. Clanchy, *From Memory to Written Record, England 1066–1307*, 2d ed. (Oxford: Blackwell, 1993), 124.
7. The fifteenth-century document records the settlement of a land dispute between individuals. The third copy, the "foot of the fine," is the extant part. Clanchy, *From Memory to Written Record*, 68–69. The document is reproduced in Charles Johnson and Hilary Jenkinson, *English Court Hand A.D. 1066–1500* (New York: Frederick Ungar Publishing Co., 1967), plate XLIIa.
8. For charters in Anglo-Saxon, see Additional Charter 19791 in *Facsimiles of Ancient Charters in the British Museum III* (London: Trustees of the British Museum, 1877); and Cotton Charter VIII.37, Additional Charter 19796, Additional Charter 19799, and Cotton MS Augustus II.70, in *Facsimiles of Ancient Charters in the British Museum IV* (London: Trustees of the British Museum, 1878).
9. Clanchy, *From Memory to Written Record*, 50.
10. Clanchy, *From Memory to Written Record*, 88.
11. Clanchy, *From Memory to Written Record*, 97.
12. Clanchy, *From Memory to Written Record*, 68–69.
13. The National Archives, E 210/162; E 210/163; CP 25/1/98/55; shelf markers provided on-site at the N.A., information available from the web catalog differs. Reproduced in Charles Johnson and Hilary Jenkinson, *English Court Hand*, I, 154, no. XVIIB, plus plate.
14. The full statement was perhaps something like "Christo me crucis": "By me, Christ of the cross."
15. The charter is Cotton Charter VIII.27, reproduced in *Facsimiles of Ancient Charters in the British Museum III* (London: Trustees of the British Museum, 1877). Another possible early example of a chirograph cannot be verified. An English charter in Latin dated 855 is discussed in the modern scholarly literature, but no original or authentic copy exists, and there is no indication that it actually was a chirograph. The designation "chirograph" seems to originate not from the document itself but from an eighteenth-century scholar who printed the text of the charter. The shelf marker of the charter, Somers Ch. 7, is legitimate and belongs to a recognized collection, that of Worcester Cathedral, but the document must have been lost between the eighteenth century, the date of the printed edition, and the twentieth, when scholars note it as lost. While it would be exciting to have such an early example, we cannot now verify that this lost document was, indeed, a chirograph.
16. The text of the charter is printed in Daniel Haigneré, *Les chartes de Saint-Bertin* (Saint-Omer: Imprimerie et lithographie H. D'Homont, 1886), 21, no. 66, where it is incorrectly dated 994. Bernhard Bischoff, "Zur Frühgeschichte des mittelalterlichen Chirographum," in *Mittelalterliche Studien* vol. I (Stuttgart: Anton Hiersemann, 1966), 118, and A. de Boüard, *Manuel de diplomatique française et pontificale* vol. II (Paris: Auguste Picard, 1948), 144 note 3, date it to 944.
17. Examples of ninth-century charters that say they are to be copied in multiples are found in Walter de Gray Birch, *Cartularium Saxonicum: A Collection of Charter Relating to Anglo-Saxon History* vol. I (London: Whiting & Co., 1887), 421, 423.
18. Albert Bruckner and Robert Marichal, *Chartae latinae antiquiores* vol. IV (Olten: U. Graf, 1954–), xx–xxi.
19. See James Elkins, "On the Impossibility of Close Reading: The Case of Alexander Marshack" (in Cultural Representation and the Methodology of Close Reading in Archaeology), *Current Anthropology* 37, no. 2 (April 1996): 185–226.
20. See, for example, one described by Edward L. Shaughnessy in "Western Zhou Bronze Inscriptions," in *New Sources of Early Chinese History: An Introduction to the Reading of Inscriptions and Manuscripts*, ed. Edward L. Shaughnessy (Berkeley: Society for the Study of Early China and Institute of East Asian Studies, University of California, 1997), 80–81.
21. Jiayuan An, Qigang Sun, and Xuezhong Li, *A Journey into China's Antiquity* vol. 1 (Beijing: National Museum of Chinese History and Morning Glory Publishers, 1997), 187.
22. Guanying Wang, Zhiben Wang, Chengjun Chen, Yonghong Wang, Guolong Lai, Wenliang Shao, and Xingzheng Wang, *A Journey into China's Antiquity* vol. 2 (Beijing: National Museum of Chinese History and Morning Glory Publishers, 1988), 33.
23. http://www.scriptorium.lib.duke.edu/papyrus/texts/world.html.
24. See *The Papers of Benjamin Franklin*, vol. 30 (New Haven: Yale University Press), 345.
25. http://www.scripophily.net/amerbanknote.html.

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1. John R. Graham, and Campbell Harvey, "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics* 60, nos. 2–3 (2001): 187–243.
2. Irving Fisher, *The Theory of Interest* (New York: The Macmillan Company, 1930).
3. Geoffrey Poitras, *The Early History of Financial Economics, 1478–1776* (Northampton, Mass.: Edward Elgar, 2000).
4. From L.E. Sigler, *Fibonacci's* Liber Abaci*: A Translation Into Modern English of Leonardo Pisano's Book of Calculation* (New York: Springer-Verlag, 2002). Spellings of the title of the book differ. I use the spelling from Sigler, but *Liber Abbaci* is also common.
5. Although the scholarly contributions based on primary archival sources are too numerous to cite here, synthetic works in this tradition include Ferdinand Braudel's classic three-volume work *Civilization and Capitalism 15th–18th Century*, 3 vols. (Berkeley: University of California Press, 1973–1984); Joseph Gies's *Merchants and Moneymen: The Commercial Revolution, 1000–1500* (New York: Ty Crowell, 1972); and Robert S. Lopez's *The Commercial Revolution of the Middle Ages, 950–1350* (Englewood Cliffs, N.J.: Prentice-Hall, 1971).
6. Avner Greif, "Reputation and Coalitions in Medieval trade: Evidence on the Maghribi Traders," *The Journal of Economic History* 49, no. 4 (Dec. 1989): 857–82.
7. Peter Spufford, *Power and Profit: The Merchant in Medieval Europe* (New York: Thames and Hudson, 2002).
8. Joseph and Frances Gies, *Leonardo of Pisa and the New Mathematics of the Middle Ages* (New York: HarperCollins, 1969) provide a brief, but very readable popular account of the life of Leonardo.
9. See Alfred E. Leiber, "Eastern Business Practices and Medieval European Commerce," *The Economic History Review*, n.s. 21, no. 2 (Aug. 1968): 230–43. According to Lieber, European merchants who traded with eastern Mediterranean ports may have exported regulatory practices as well as goods. The modern French word "duanes," for example, derives from the Arabic "dowanes" for customs.
10. Leiber, "Eastern Business Practices," notes regular business correspondence in Arabic between Muslim and Pisan merchants from the years 1200 to 1202.
11. Sigler, *Fibonacci's* Liber Abaci, 15. It is of interest that Leonardo learned mathematics from teachers as opposed to books. Although he cites other works, his own account suggests that mathematical education during his lifetime was, at least in large part, an oral tradition.
12. Warren Van Egmond, *Practical Mathematics in the Italian Renaissance: A Catalogue of Italian Abbacus Manuscripts and Printed Books to 1600.* Supplemento agli Annali dell'Instituto e Museo di Storia della Scienza (Firenze: Fascicolo 1, 1980), 7.
13. Ibid., 8.
14. Sigler, *Fibonacci's* Liber Abaci, 10.
15. The Riccardiana manuscript number 783 is similar to the version translated into modern Italian by Baldassare Boncompagni, *Scritti di Leonardo Pisano, matematico del secolo decimoterzo, vol. 1 : Il Liber Abaci di Leonardo Pisano,* pubblicato secondo la lezione del codice Magliabechiano C. I, 2616, Badia Fiorentina, no. 73, Tipografia delle scienze matematiche e fisiche (Rome, 1857). A useful description of the manuscript can be found in Van Edgemond, *Practical Mathematics.*
16. The library was founded by Francesco Riccardi and his wife Cassandra Capponi, who built a special room in their Palazzo to house their respective family libraries. Cassandra's father, Vicenzio Bernardino, collected scientific and scholarly work. Known for his erudition, he translated the psalm of David and the book of Job, and was said to be among Galileo's friends. (See Malinima, Paolo, *I Riccardi di Firenz: Una famiglia e un patrimonio nella Toscana dei Medici*, ed. Leo S. Olschki [Firenze, 1977], 179.) Vicenzio's interest in science would have made him a natural candidate to be the collector who acquired the Fibonacci manuscripts. It is possible to trace many works in the Biblioteca Riccardia to Vicenzo's collection through identifying marks; however,neither of the two copies of *Liber Abaci* bear them. And although the Riccardi family had residences and business in Pisa throughout the fifteenth century, there is little information about their book collections before the founding of the library.
17. "qui eis tam per doctrinam quam per sedula obsequia discreti et sapientis viri magistri Leonardi Bigolli, in abbacandis estimationibus et rationibus civitatis." http://www.mathematik.uni-kl.de/~luene/miszellen/Fibonacci.html. Accessed by author 10/12/2004.
18. An English translation of *The Algebra* is by Frederic Rosen, *The Algebra of Mohammed Ben Musa* (London: The Oriental Translation Fund and J. Murray, 1831).
19. For an account of the earliest European algebras, see Karl Menninger, *Number Word and Number Symbols* (Cambridge: MIT Press, 1969): 410–12. Also useful is Louis C. Karpinski, "Two Twelfth Century Algorisms" *Isis* 3, no. 3 (Summer 1921): 396–413; and Suzan Rose Benedict, *A Compara-*

tive Study of the Earliest Treatises Introducing into Europe the Hindu Art of Reckoning (Ph.D. diss., University of Michigan, 1914).

20. Rosen, *The Algebra of Mohammed Ben Musa*, 87.
21. Walter E. Clark, *The Āryabhatīya of Āryabhata* (Chicago: University of Chicago Press, 1930), 38–40. Clark discusses the possibility that some portions of the work were actually added later, perhaps as late as the tenth century.
22. Sreeramula Rajeswara Sarma, "Rule of Three and Its Variations in India." In *From China to Paris: 2000 Years Transmission of Mathematical Ideas*, ed. Yvonne Dold-Samplonius, Joseph W. Dauben, Menso Folkerts, Benno van Dalen (Stuttgart: Franz Steiner Verlag, 2002), 133–56.
23. R. Ramanujacharia and G.R. Kaye, "The Trisatika of Sridharacarya," *Bibliotheca Mathematica*, series 3 (1913): 203–17.
24. The legal tradition in India pertaining to loans and interest rates is a long one. See M.P.V. Kane, *History of Dharmaśastra*, Government Oriental Series Class B Ro. 6 (Poona: Bhandarkar Oriental Research Institute, 1946) 3: 419*ff*. This classic study of India's ancient and medieval law describes legal texts dating from the first four centuries A.D. and deals with the classification and calculation of interest on loans of various sorts, from unsecured debt to mortgages to investment in seafaring enterprises. Thus the commercial context for the development of the mathematics of discounting in India preceded the surviving mathematical texts on the subject.
25. Martin Levey, "The Encyclopedia of Abraham Savasorda: A Departure in Mathematical Methodology," *Isis* 43 no. 3 (Sept. 1952): 257–64.
26. Shen Kanshen, John N. Crossley, and Anthony W.-C. Lun, *The Nine Chapters on the Mathematical Art: Companion and Commentary* (Oxford: Oxford University Press, 1999).
27. Ibid., 345.
28. Ibid., 383.
29. Sigler *Fibonacci's* Liber Abaci, 128.
30. See Sarma, "Rule of Three," for an early history of the Rule of Three.
31. Sigler *Fibonacci's* Liber Abaci, 168.
32. Ibid., 176.
33. Ibid., 184.
34. Ibid.
35. Sarma, "Rule of Three."
36. Peter Spufford, *Handbook of Medieval Exchange* (London: Offices of the Royal Historical Society, 1986).
37. John, H. Pryor, "The Origins of the Commenda Contract," *Speculum* 52 no. 1 (Jan. 1977): 5–37.
38. Sigler, *Fibonacci's* Liber Abaci, 10.
39. Ibid., 172.
40. Kangshen, Crossley, and Lun, *The Nine Chapters*, 391.
41. Sigler, *Fibonacci's* Liber Abaci, 372.
42. Ibid., 383.
43. Ibid., 384.
44. John H. Munro, "The Medieval Origins of the Financial Revolution: Usury, Rentes, and Negotiability," *The International History Review* 25 no. 3 (Sept. 2003): 505–62.
45. There is evidence in *Liber Abaci* that Fibonacci's financial analysis may have roots in the ancient Near East. Consider this problem: "A certain man gave one denaro at interest so that in five years he must receive double the denari, and in another five he must have double two of the denari and thus forever from 5 to 5 years the capital and interest are doubled. It is sought how many denari from this one denaro he must have in 100 years." Compare this to the problem from the Old Babylonian tablet 8528 in the Berlin museum published in Otto Neugebauer, *Mathematische Keilschrift: Texse* (Berlin: Springer-Verlag, 1935). It asks: "If I lent one mina of silver at the rate of 12 shekels [a shekel is equal to one-sixtieth of a mina] per year, and I received in repayment, one talent [60 minas] and 4 minas. How long did the money accumulate?" (Sigler, *Fibonacci's* Liber Abaci, 437). The solution is found by capitalizing interest only when the outstanding principal doubles. At 20 percent, the principal doubles every five years. Thus, the answer is that it would take 30 years for the debt to grow to 64 minae. The doubling over five year intervals seems a striking parallel, particularly given the fact that an annual compound rate that yields that result is not a round number—it is something less than 15 percent.
46. Sigler, *Fibonacci's* Liber Abaci, 392.
47. Eliyahu Ashtor published the earliest known bill of exchange which appears to date from 1220, in *Levant Trade in the Later Middle Ages* (Princeton: Princeton University Press, 1983). Cited in Meir Kohn, "Bills of Exchange and the Money Market to 1600" (working paper, Dartmouth College, 1999). http://www.dartmouth.edu/~mkohn/99-04.pdf. The latter is an up-to-date and excellent survey of bills of exchange. Gérard Sivéry identifies an Italian discount contract with an implicit

interest rate of around 11 percent from the year 1252, in "Mouvements de capitaux et taux d'interêt en occident au XIIIe siècle," *Annales Economies Societés Civilizations* 38 (1983): 367. Quoted in Spufford, *Power and Profit*.

48. Luciano Pezzolo, "Bonds and Government Debt in Italian City-States, 1250–1650," chapter 8 in this volume.
49. Jean Favier, *Finance and Fiscalité au Bas Moyen Âge* (Paris: Société D'Édition D'Enseignement Supérieur, 1971), 283.
50. David Herlihy, *Pisa in the Early Renaissance: a Study of Uurban Growth* (New Haven: Yale University Press, 1958). Chapter 6 describes these new contracts. Pezzolo, "Bonds and Government Debts," cites examples of similar sales of income rights in Genoa in 1152 and Venice in 1164.
51. David Herlihy, *Medieval and Renassiance Pistoia* (New Haven: Yale University Press, 1967), 138–39.
52. Sigler, *Fibonacci's* Liber Abaci, 437.
53. Warren Van Egmond, *Practical Mathematics in the Italian Renaisance: A Catalogue of Italian Abbacus Manuscripts and Printed Books to 1600*, Monographia n. 4 (Firenze: Instituto di Storia Della Scienza Firenzi, 1980). Also Nathalie Zemon Davis, "Sixteenth-Century French Arithmetics on the Business Life." *Journal of the History of Ideas* 21, no. 1 (Jan.–Mar. 1960): 18–48.
54. For the evolution of arithmetic schools in the tradition of Fibonacci, see, for example, Poitras, *The Early History of Financial Economics*, and Frank J. Swetz, *Capitalism and Arithmetic: The New Math of the Fifteenth Century* (LaSalle, Ind.: Open Court, 1987).
55. Swetz, *Capitalism and Arithmetic*, 293.
56. See Poitras, *The Early History of Financial Economics*, 160 for a discussion of the *Treviso*'s limited coverage of interest rate problems.
57. Jean Trenchant, *L'Arithmetique*, 2d ed. (1558; 2d ed. Lyons, 1637), 307. Author's translation.

CHAPTER 8. BONDS AND GOVERNMENT DEBT IN ITALIAN CITY-STATES, 1250–1650

I wish to thank James Tracy and Giuseppe Tattara for their comments on an earlier version of the paper, and Giorgio Felloni, who kindly provided documents from the State Archives of Genoa.

1. ASV (State Archives, Venice), Maggior Consiglio, Fractus, 17v; R. Cessi ed., *La regolazione delle entrate e delle spese (sec. xiii–xiv)* (Padova, 1925), doc. 1.
2. H. Sieveking, *Studio sulle finanze genovesi e in particolare sulla Casa di S. Giorgio*, Atti della Società di storia patria 35 (Genova, 1905–1907), 48.
3. G. Luzzatto ed., *I prestiti pubblici della Repubblica di Venezia (sec. XIII-XV)* (Padova, 1929), 3; G. Luzzatto, *Storia economica di Venezia dall'XI al XVI secolo* (Venezia, 1961), 28–29.
4. G. Luzzatto, *Il debito pubblico della Repubblica di Venezia* (Milano and Varese, 1963), 11.
5. Among the very few comparative essays on Italian debts, see J. Day, "Moneta metallica e moneta creditizia," in *Storia d'Italia. Annali*, vol. 6, ed. R. Romano and C. Vivanti (Torino, 1983), 340–60; A. Molho, "Tre città-stato e i loro debiti pubblici. Quesiti e ipotesi sulla storia di Firenze, Genova e Venezia," in *Italia 1350–1450: Tra crisi, trasformazione, sviluppo*, ed. S. Gensini (Pistoia, 1993), 185–215. For the earlier period, see M. Ginatempo, *Prima del debito. Finanziamento della spesa pubblica e gestione del deficit nelle grandi città toscane (1200–1350 ca.)* (Firenze, 2000).
6. The following paragraphs rely on R. Mueller, *The Venetian Money Market: Banks, Panics, and the Public Debt, 1200-1500* (Baltimore and London, 1997); L. Pezzolo, *Il fisco dei veneziani. Finanza pubblica ed economia tra XV e XVII secolo* (Verona, 2003); and L. Pezzolo, "The Venetian Government Debt 1350–1650," in *Urban Public Debts: Urban Governments and the Market for Annuities in Western Europe, Fourteenth–Eighteenth Centuries*, ed. M. Boone, K. Davids, and P. Janssens (Leuven, 2003).
7. B. Barbadoro, *Le finanze della Repubblica fiorentina. Imposta diretta e debito pubblico fino all'istituzione del Monte* (Firenze, 1929). For Venice, see Pezzolo, *Il fisco dei veneziani*, 36; and Pezzolo, "The Venetian Government Debt 1350–1650"; for Genoa, see Sieveking, *Studio sulle finanze genovesi e in particolare sulla Casa di S. Giorgio*, 40–41.
8. R. Barducci, "Le riforme finanziarie nel tumulto dei Ciompi," in *Il tumulto dei Ciompi. Un momento di storia fiorentina ed europea* (Firenze, 1981), 95–102.
9. A. Molho, *Fiorentine Public Finances in the Early Renaissance, 1400–1434* (Cambridge, Mass., 1971), 63.
10. Mueller, *The Venetian Money Market*, 465; Molho, *Fiorentine Public Finances*, 61–62.
11. A. Molho, *Marriage Alliance in Late Medieval Florence* (Cambridge, Mass., 1994).
12. ASF (State Archives, Florence), Carte strozziane, I ser., XI, c. 39v.
13. C.B. Menning, *Charity and State in Late Renaissance Italy: The Monte di Pietà of Florence* (Ithaca and London, 1993).
14. On Genoese financial history see Sieveking, *Studio sulle finanze genovesi e in particolare sulla Casa di S. Giorgio*; J. Heers, *Gênes au XVe siècle. Aspectes économiques et sociaux* (Paris, 1961); and G. Felloni, *Scritti di storia economica*, vol. 1 (Genova, 1999).

15. N. Machiavelli, *Istorie fiorentine*, ed. F. Gaeta (Milano, 1962), 561: "li cittadini hanno levato lo amore dal Comune come cosa tiranneggiata e postolo a San Giorgio come parte bene e ugualmente amministrata." See also S.A. Epstein, *Genoa and the Genoese, 958–1528* (Chapel Hill and London, 1996), 280–81.
16. ASV, Mensa patriarcale, b. 64, reg. I, 13r; Luzzatto, *Il debito pubblico della Repubblica di Venezia*, 258; Mueller, *The Venetian Money Market*.
17. Mueller, *The Venetian Money Market*, 496.
18. Mueller, *The Venetian Money Market*, 491.
19. B. Barbadoro, *Le finanze della Repubblica fiorentina*, 642–43.
20. Data elaborated from R. Mueller, "Foreign Investment in Venetian Government Bonds and the Case of Paolo Guinigi, Lord of Lucca, Early Fifteenth Century," in *Cities of Finance*, ed. H. Diedericks and D. Reeder (Amsterdam, 1996), 82.
21. Mueller, *The Venetian Money Market*, 464; Sieveking, *Studio sulle finanze genovesi e in particolare sulla Casa di S. Giorgio*, 33.
22. R. Barducci, "Politica e speculazione finanziaria a Firenze dopo la crisi del primo Trecento (1343–1358)," *Archivio storico italiano*, 137 (1979), 180.
23. Heers, *Gênes au XVe siècle*, 624.
24. Mueller, *The Venetian Money Market*, 464.
25. A. Molho, "Tre città-stato e i loro debiti pubblici, 208.
26. E. Conti, *L'imposta diretta a Firenze nel Quattrocento (1427–1494)* (Roma, 1984), 38.
27. Molho, "Tre città-stato e i loro debiti pubblici," 192; Felloni, *Scritti di storia economica*, 466.
28. G. Brucker, *Dal Comune alla Signoria. La vita pubblica a Firenze nel primo Rinascimento* (Bologna, 1981), 61.
29. D. Herlihy and C. Klapisch-Zuber, *Les Toscanes et leurs familles. Une étude du catasto florentin* (Paris, 1978), 340.
30. G. Guidi, *Lotte, pensiero e istituzioni politiche nella repubblica fiorentina dal 1494 al 1512*, vol. 3 (Firenze, 1992), 905–6.
31. Heers, *Gênes au XVe siècle*.
32. Molho, *Marriage Alliance in Late Medieval Florence*, 100.
33. A. Sapori, *Studi di storia economica (secoli XIII-XIV-XV)* (Firenze, 1955), 239–40. For the controversy on public debt and usury, L. Armstrong, *Ursury and Public Debt in Early Renaissance Florence: Lorenzo Ridolfi on the Monte Comune* (Toronto: Pontifical Institute of Mediaeval Studies, 2003).
34. R. Dini, *Manifattura, commercio e banca nella Firenze medievale* (Firenze, 2001), 94; see also Sapori, *Studi di storia economica*, 197.
35. S. Tognetti, *Il banco Cambini. Affari e mercati di una compagnia mercantile-bancaria nella Firenze del XV secolo* (Firenze, 1999), 149; M. Del Treppo, "Aspetti dell'attività bancaria a Napoli nel '400," in *Aspetti della vita economica medievale* (Firenze, 1985), 577, 592.
36. S. Collodo, *Una società in trasformazione. Padova tra XI e XV secolo* (Padova, 1990), 198, 203, 206, 208–211; Heers, *Gênes au XVe siècle*, 259; P. Malanima, *L'economia italiana. Dalla crescita medievale alla crescita contemporanea* (Bologna, 2002), 280. The Italian data of G. Clark, "The Cost of Capital and Medieval Agriculture Technique," *Explorations in Economic History*, 25 (1988): 265–94 at 274, are too scanty.
37. E. Ashtor, "Profits from Trade with the Levant in the Fifteenth Century," *Bulletin of the School of Oriental and African Studies, University of London*, 38 (1975), 268–87.
38. F. Lane, *I mercanti di Venezia* (Torino, 1982), 140. By the middle of the sixteenth century some Venetian merchants expected at least 10 percent of profit from the spice trade in Levant. See, for example, U. Tucci, *Préface* to *Lettres d'un marchand vénitien, Andrea Barbarigo* (1553–1556) (Paris, 1957), 9.
39. Mueller, *The Venetian Money Market*, 476–77; G. Luzzatto, *L'attività commerciale di un patrizio veneziano del Quattrocento*, in Id., *Studi di storia economica veneziana* (Padova, 1954), 170 (interest claims on the Monte being valued at 50 percent); Conti, *L'imposta diretta a Firenze nel Quattrocento*, 48; J. Kirshner and J. Klerman, "The Seven Percent Fund of Renaissance Florence," in *Banchi pubblici, banchi privati e monti di pietà nell'Europa preindustriale*, vol. 1 (Genova, 1991), 370 n.
40. Felloni, *Scritti di storia economica*, 599; Heers, *Gênes au XVe siècle*, 169–72; J. Gentil da Silva, "Le sconto à Gênes. A propos d'un croquis," *Annales* E.S.C., 13 (1959), 150–53; J. Kirshner, "The Moral Problem of Discounting Genoese *Paghe*, 1450–1550," *Archivum fratrum praedicatorum*, 47 (1977), 109–70.
41. Heers, *Gênes au XVe siècle*, 164–66.
42. ASV, Provveditori in Zecca, 1685–89, 1691–92.
43. J. Day, *Les douanes des Gênes 1376–1377* (Paris, 1963), xxv; Pezzolo, "The Venetian Government Debt 1350–1650."

44. Data elaborated from Felloni, *Scritti di storia economica*, 288.
45. J. Day, "The Great Bullion Famine of the Fifteenth Century," *Past and Present*, 79 (1978): 3–54; and remarks by H.-P. Baum, "Annuities in Late Medieval Hanse Towns," *Business History Review*, 59 (1985): 24–48.

CHAPTER 9. VENTURE SHARES OF THE DUTCH EAST INDIA COMPANY

1. Josseph de la Vega, 1688, in *Confusion de confusiones*, introd. and trans. M. F. J. Smith (The Hague: Martinus Nijhoff, 1939).
2. Jonathan I. Israel, *Dutch Primacy in World Trade, 1585–1740* (Oxford: Oxford University Press, 1989), chap. 1.
3. J. R. Bruijn, F. S. Gaastra, and I. Schöffer, with assistance from A. C. J. Vermeulen, *Dutch-Asiatic Shipping in the Seventeenth and Eighteenth Centuries*, vol. 1, *Introductory Volume*, Grote Serie of Rijks Geschiedkundeige Publicatien, no. 167 (The Hague: Martinus Nijhoff, 1987), chap. 1.
4. J. G. Van Dillen, *Het oudste aandeelhoudersregister van de kamer Amsterdam der Oost-Indische Compagnie* (The Hague: Martinus Nijhoff, 1958), 259.
5. Oscar Gelderblom and Joost Jonker, "The Finance of the Dutch East India Trade and the Rise of the Amsterdam Capital Market, 1595–1612," *Journal of Economic History* 64:3 (September 2004), 641–672.
6. Gelderblom and Jonker, "The Finance of the Dutch East India Trade," 646.
7. J. P. De Korte, *De Jaarlijkse financiële Verantwoording in de VOC* (The Hague: Martinus Nijhoff, 1983), chap. 1.
8. P. G. M. Dickson, *The Financial Revolution in England: A Study in the Development of Public Credit, 1688–1756* (London: Macmillan, 1967), 459, n. 6.
9. Bank of England Archives, AC 27/383, "Register Book of Contracts in Bank Stock" (April 13, 1697, to October 27, 1721).
10. Dickson, *The Financial Revolution in England*, 473–75.
11. Dickson, *The Financial Revolution in England*, 475.
12. Dickson, *The Financial Revolution in England*, 474 table.

CHAPTER 10. PERPETUITIES IN THE STREAM OF HISTORY: A PAYING INSTRUMENT FROM THE GOLDEN AGE OF DUTCH FINANCE

We thank Michael Montias for his help in reading old Dutch documents discussed in this chapter.

1. The origins of regional supervision of the Lek dike can be traced back to the eleventh century, and the existence of the Lekdijk College to 1230. See M. Van Vliet, *Het Hoogheemraadschap van de Lekdijk Bovendams* (Van Gorcum, Assen, 1961), 63–65. Regulations governing impositions for the maintenance of locks and bridges are traced to the early ninth century by S.J. Fokkema Andrae, *Het Hoogheemraadschap van Rijnland* (Leiden, 1934), 10–11.
2. Van Vliet, *Het Hoogheemraadschap van de Lekdijk Bovendams*, 76–82.
3. Unie van Waterchappen, *Water Boards* (Den Haag, 1999), 4.
4. Van Vliet, *Het Hoogheemraadschap van de Lekdijk Bovendams*, 270.
5. Donkersloot-de Vrij, M.J. Greiev, H. Hovenkamp, G. Jonkers, P. van der Lee, and G. Wammes, *De Stichtse Rijnlanden* (Utrecht: Matrijs, 1993), 60.
6. Violet Barbour, *Capitalism in Amsterdam in the Seventeenth Century*, Johns Hopkins University Studies in Historical and Political Science series LXVII, no. 1 (1950), 82.
7. Van Vliet, *Het Hoogheemraadschap van de Lekdijk Bovendams*, 271.
8. Bruno Kuske, *Schuldenwesen der deutschen Städte in Mittelalter* (Tubingen, H. Lapp, 1904), 12–13.
9. Edwin W. Kopf, "The Early History of the Annuity," *Proceedings of the Casualty Actuarial Society*, 13 (27) 1926, 225–66.
10. John Munro, "The Late-Medieval Origins of the Modern Financial Revolution: Overcoming Impediments from the Church and State," *The International History Review* 25:2, June 2003.
11. James Tracy, "Long Term Urban Debt in Medieval Europe," in *Urban Public Debts: Urban Government and the Market for Annuities in Western Europe (Fourteenth–Eighteenth Centuries)*, ed. M. Boone, K. Davids, and P. Janssens (Turnhout, Belgium: Brepols Publishers, 2003).
12. Tracy, "Long Term Urban Debt in Medieval Europe," 20.
13. James Tracy, *A Financial Revolution in the Hapsburg Netherlands* (Berkeley: University of California Press, 1985).
14. Martijn van der Burg and Marjolein't Hart, "Renteniers and the Recovery of Amsterdam's Credit (1578–1605)," in *Urban Public Debts: Urban Government and the Market for Annuities in Western Europe (Fourteenth–Eighteenth Centuries)*, ed. M. Boone, K. Davids, and P. Janssens (Turnhout, Belgium: Brepols Publishers, 2003).
15. Laurence Derycke, "The Public Annuity Market in Bruges at the End of the Fifteenth Century,"

in *Urban Public Debts: Urban Government and the Market for Annuities in Western Europe (Fourteenth–Eighteenth Centuries)*, ed. M. Boone, K. Davids, and P. Janssens (Turnhout, Belgium: Brepols Publishers, 2003).

16. Barbour, *Capitalism in Amsterdam in the Seventeenth Century*, 81, cites Englishman William Temple's account of Dutch finance at the end of the seventeenth century, which marvels at the ease with which Holland could tap the resources of her citizenry though debt issues.
17. Tracy, *Financial Revolution*, passim.
18. Barbour, *Capitalism in Amsterdam in the Seventeenth Century*, 81. For evidence on the discounts to Dutch debt in the 1670s, see Julius Grossman, *Die Amsterdamer Börse vor zwei Hundert Jahren. Ein Beitrag zur Geschichte der Politik und des Börsenwesens im mittleren Europa (1672–1673) nach den Akten des Wiener Staats-Archives* (Haag: M. Nijhoff, 1876).
19. Remi Van Schäik, "The Sale of Annuities and Financial Politics in a Town in the Eastern Netherlands, 1400–1600," in *Urban Public Debts: Urban Government and the Market for Annuities in Western Europe (Fourteenth–Eighteenth Centuries)*, ed. M. Boone, K. Davids, and P. Janssens (Turnhout, Belgium: Brepols Publishers, 2003).
20. Barbour, *Capitalism in Amsterdam in the Seventeenth Century*, 83.
21. An excellent account of these developments may be found in Geoffrey Poitras, *The Early History of Financial Economics, 1478–1776* (Northampton, Mass.: Edward Elgar Publishers, 2000).
22. Poitras, *Early History of Financial Economics*, 190.
23. Fredrick Hendricks, "Contributions to the History of Insurance and the Theory of Like Contingencies," *The Assurance Magazine, and Journal of the Institute of Actuaries*, vol. 3 (1853): 93–121.
24. For simplicity we have ignored the fact that payments are made semiannually.
25. Sidney Homer, *A History of Interest Rates* (New Brunswick: Rutgers University Press, 1963), 128.
26. Jacob Bernoulli, "Questiones Nonnullae de Usuris, Cum solutione Problematis de sorte Aleatorum, propositi in Ephemerid," in *Jacobi Bernoulli Basileen Opera* (Genevae: Cramer & Philibert, 1744), 427–31.
27. See Poitras, *Early History of Financial Economics*, 217.
28. See William N. Goetzmann, "Fibonacci and the Financial Revolution," chapter 7 in this volume.

CHAPTER 11. AMSTERDAM AS THE CRADLE OF MODERN FUTURES AND OPTIONS TRADING, 1550–1650

The authors would like to thank Nico van Horn for research assistance. Abbreviations in text: ACA, Amsterdam City Archives; DNA, Dutch National Archives; NA, Notarial Archives

1. Cf., for instance, P. J. Blok, "Mémoire touchant le negoce et la navigation des hollandois," *Bijdragen en Mededeelingen van het Historisch Genootschap* 24 (1903): 221–342, at 234; M. F. J. Smith, *Tijdaffaires aan de Amsterdamsche beurs* (The Hague: Nijhoff, 1919), 96–101; J. G. van Dillen, "Termijnhandel te Amsterdam in de 16e en 17e eeuw," *De economist* 76 (1927): 503–23; V. Barbour, *Capitalism in Amsterdam in the Seventeenth Century* (Baltimore: John Hopkins University Press, 1950), 74–80; H. van der Wee, "Monetary, Credit, and Banking Systems," in *The Cambridge Economic History of Europe* vol. 5, ed. E. E. Rich and Ch. Wilson (Cambridge, 1977), 240–392. Richard Ehrenberg also insisted that wagers were the forerunner of derivates, though he recognizes potential benefits of derivatives trading: *Das Zeitalter der Fugger, Geldkapital und Creditverkehr im 16. Jahrhundert*, vol. 2, *Die Weltbörsen und Finanzkrisen des 16. Jahrhunderts* (Jena: Fischer, 1896), 308.
2. For an analysis of contemporary Dutch attitudes to speculation and particularly *windhandel*, see N. De Marchi and P. Harrison, "Trading 'in the Wind' and with Guile: The Troublesome Matter of the Short Selling of Shares in Seventeenth-Century Holland," in *Higgling: Transactors and Their Markets in the History of Economics*, ed. N. De Marchi and M.S. Morgan (Durham: Duke University Press, 1994), 47–65. Swan, *Building the Global Market, 78–79*; cf. E.H. Krelage, *Bloemenspeculatie in Nederland, de Tulpomanie van 1636–1637 en de Hyacintenhandel 1720–1736* (Amsterdam: Van Kampen, 1942), 95–96, referring to Dutch court considerations about this point, elaborated by the German philosopher of law R. Stammler, "Die Harlemer Tulpenmanie," *Deutsches Rechtsleben im alten Reich* 1 (1928).
3. Cf., for instance, R.A. Brealey and S.C. Myers, *Principles of Corporate Finance*, 4th ed. (New York: McGraw-Hill, 1991), 483–504; "Greenspan, Unlike Buffett, Sees Derivatives as Positive Influence," *New York Times*, March 8, 2003, p. C14; "Off Target," and "Buffetted," *The Economist*, March 15, pp. 14 and 74, respectively.
4. E. J. Swan, *Building the Global Market, a Four Thousand Year History of Derivatives* (The Hague: Kluwer Law, 2000), 28–29, 36–37. On 139–221, Swan jumps from Antwerp to London. G. Poitras, *The Early History of Financial Economics, 1478–1776, from Commercial Arithmetics to Life Annuities and Joint Stocks* (Cheltenham: Elgar, 2000), 335–381, gives a far more comprehensive picture, including the emergence of rice futures in eighteenth-century Japan, described in full by

U. Schaede, "Forwards and Futures in Tokugawa Period Japan," *Journal of Banking and Finance* 13 (1989): 487–513.

5. J. Penso de la Vega, *Confusion de confusiones* (Amsterdam, 1688). Complete Dutch edition by G.J. Geers and M.F.J. Smith (The Hague: Nijhoff, 1939); a selection of the text in English trans. H. Kellenbenz (Cambridge, Mass., 1957), republished by M.S. Fridson (New York, 1996). The first economic historian to draw attention to de la Vega's work was Richard Ehrenberg, "Die Amsterdamer Aktienspekulation im 17. Jahrhundert," in *Conrad's Jahrbücher für NationalÖkonomie und Statistik* 3. Folge III. Band (1892) 809–26. About de la Vega: J.I. Israel, "The Amsterdam Stock Exchange and the English Revolution of 1688," *Tijdschrift voor geschiedenis* 103 (1990): 412–440; J.I. Israel, "Een merkwaardig literair werk en de Amsterdamse effectenmarkt in 1688: Joseph Penso de la Vega's *Confusion de confusiones*," *De zeventiende eeuw* 6 (1990): 159–161
6. Ch. Wilson, *Anglo-Dutch Commerce and Finance in the Eighteenth Century* (Cambridge: Cambridge University Press, 1941), 79-87; P.G.M. Dickson, *The Financial Revolution in England: A Study in the Development of Public Credit 1688–1756* (Oxford: Oxford University Press, 1967), 491, 507–510; L. Neal, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge: Cambridge University Press, 1990), 16–19, 141–165; R.C. Michie, "The Invisible Stabilizer: Asset Arbitrage and the International Monetary System since 1700," *Financial History Review* 5 (1998): 5–26.
7. Sayous, "Spéculation," 38–46; W.S. Unger, "De Hollandsche graanhandel en Graanhandelspolitiek in de Middeleeuwen," *De Economist* 65 (1916): 243–269, 337–386, 461–486, at 365–366; Van Dillen, "Termijnhandel."
8. Cf. J.G. van Dillen, "Isaac le Maire en de handel in actiën der Oost-Indische Compagnie," *Economisch-historisch jaarboek* 16 (1930): 1–165. Also, O. Gelderblom and J. Jonker, "Completing a Financial Revolution: The Finance of the Dutch East India Trade and the Rise of the Amsterdam Capital Market, 1595–1612," *The Journal of Economic History* 64:3 (September 2004): 641–672.
9. M. Dash, *Tulipomania: The Story of the World's Most Coveted Flower and the Extraordinary Passions It Aroused* (London, 1999); cf. also E.H. Krelage, *Bloemenspeculatie in Nederland, de Tulpomanie van 1636–1637 en de Hyacintenhandel 1720–1736* (Amsterdam: Van Kampen, 1942); E.H. Krelage, "Het manuscript over den tulpenwindhandel uit de verzameling-Meulman," *Economisch-Historisch Jaarboek* 22 (1940–1942): 26–48. A series of still indispensable documents was published by N.W. Posthumus, "De speculatie in tulpen in de jaren 1636 en 1637," *Economisch-Historisch Jaarboek* 12 (1926): 3–99; N.W. Posthumus, *Economisch-Historisch Jaarboek* 13 (1927) 1–85; N.W. Posthumus, *Economisch-Historisch Jaarboek* 18 (1934).
10. Swan, *Building the Global Market*, 5; Poitras, *The Early History of Financial Economics*, 335; P.L. Bernstein, *Against the Gods: The Remarkable Story of Risk* (New York: Wiley, 1996), 304–306.
11. R. Levine, "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature* 35 (1997): 688–726.
12. Sayous, "Spéculation"; De Marchi and Harrison, "Trading 'in the Wind' and with Guile."
13. Poitras, *The Early History of Financial Economics*, 348.
14. Cf., for example, the development of clearing institutes known as *liquiditeitskassen* in the Netherlands in the late nineteenth century in P.A. Geljon, "Termijnhandel in Nederland," in *Termijnhandel en termijnmarkten* ed. P.A. Geljon et al. (Deventer: Kluwer, 1988), 45–70.
15. Poitras, *The Early History of Financial Economics*, 338–340. For examples of forward trading in the Netherlands in the fifteenth century, see B.H.D. Hermesdorf, Rechtsspiegel. *Een rechtshistorische terugblik in de Lage Landen van het herfsttij* (Nijmegen: Dekker & Van de Vegt, 1980), 286–393.
16. Ehrenberg, *Das Zeitalter der Fugger*, vol. 1, 69–70.
17. P. Jeannin, "The Seaborne and the Overland Trade Routes of Northern Europe in the Sixteenth and Seventeenth Centuries," *Journal of European Economic History* 11 (1982): 5–60.
18. F.C. Lane, "Rhytm and Rapidity of Turnover in Venetian Trade of the Fifteenth Century," in *Venice and History: The Collected Papers of Frederic C. Lane*, ed. F. Braudel et al. (Baltimore, 1966), 109–127, at 109.
19. Lane, "Rhythm"; cf. also F.C. Lane, "Fleets and Fairs," in *Venice and History: The Collected Papers of Frederic C. Lane*, ed. F. Braudel et al. (Baltimore, 1966), 128–141, at 134–135.
20. To be sure, from the thirteenth century onward, merchants in the major commercial centers of Italy, Spain, France, England, and the Low Countries had been living in the same town quarters, while bankers and money changers carried out their business in designated areas (Ehrenberg, *Das Zeitalter der Fugger*, vol. 1, 70–82).
21. H. van der Wee, *The Growth of the Antwerp Market and the European Economy (Fourteenth–Sixteenth Century)*, 3 vols. (Den Haag: Nijhoff, 1963), vol. 2, 328–330. For the fairs of Bergen op Zoom, see C.J.F. Slootmans, *Paas- en Koudemarkten te Bergen op Zoom 1365–1565*, 3 vols. (Tilburg: Stichting Zuidelijk Historisch Contact, 1985).

22. Ehrenberg, *Das Zeitalter der Fugger*, vol. 2, 10–12; R. de Roover, "Anvers comme marché monétaire au XVIe siècle," *Belgisch Tijdschrift voor Filologie en Geschiedenis* 31 (1953): 1003–1047, at 1012–1014.
23. Ehrenberg, *Das Zeitalter der Fugger*, vol. 2, 14–17, 21.
24. The customs have been published electronically at http://www.kulak.ac.be/facult/rechten/Monballyu/Rechtlagelanden/Brabantsrecht/antwerpen/style.html. See also H.L.V. de Groote, *De zeeassurantie te Antwerpen en te Brugge in de zestiende eeuw* (Antwerpen: Marine Academie, 1975).
25. O. de Smedt, "De keizerlijke verordeningen van 1537 en 1539 op de obligaties en wisselbrieven, eenige kanttekeningen," *Nederlandsche historiebladen* 3 (1940–1941): 15–35; Swan, *Building the Global Market*, 143.
26. Ehrenberg, *Das Zeitalter der Fugger*, vol. 2, 7–8, 10; Van der Wee, *The Growth of the Antwerp Market*, 340–354.
27. Ehrenberg, *Das Zeitalter der Fugger*, vol. 2, 19; Van der Wee, *The Growth of the Antwerp Market*, 331–332.
28. Christoval de Villalon, *Provechoso tratado de cambios y contrataciones de mercaderes*, cap. XV, cited in Ehrenberg, *Das Zeitalter der Fugger*, vol. 2, 19–20 (trans. O. Gelderblom and J. Jonker).
29. M. van Tielhof, *De Hollandse graanhandel, 1470–1570. Koren op de Amsterdamse molen* (Den Haag, 1995), 118–120.
30. W. Brulez, "Le commerce international des Pays-Bas au XVIe siècle. Essai d'appréciation quantitative, *Revue Belge de Philologie et d'Histoire*, XLVI (1968), 1205–1221, at 1207.
31. Van Tielhof, *Hollandse graanhandel*, 215–217.
32. Town ordinance, November 9, 1556; D. Graswinckel, *Placcaet-boeck, op 't stuck vande Liif-tocht* (Leiden: Elsevier, 1651), 42, 62; R. Häpke, *Niederländische Akten und Urkunden zur Geschichte der Hanse und zur deutschen Seegeschichte*, 2 vols. (Munich, Leipzig, and Lübeck, 1913–1923), vol. 1, nr 801; Van Tielhof, *Hollandse graanhandel*, 216.
33. Sayous, "Spéculation," 30; Van Dillen, "Termijnhandel te Amsterdam in de 16e en 17e eeuw," 506–510.
34. Cf. the ordinance of Charles V, dated October 9, 1546, forbidding "pre-sales and contracts made for grain before it is sown, or still being and growing in the soil." Subsequently, the official ban was repeated in ordinances of June 28, 1547; December 31, 1556; September 25, 1565; and September 21, November 9, 1571 (Graswinckel, *Placcaetboeck*, 16–25, 29–32, 54–65, 71–79, 84–92).
35. Häpke, *Niederländische Akten*, vol. 1 nr. 801; Sayous, "Spéculation," 30; Van der Wee, "Money," 331–332.
36. Cf. the ordinances of Philip II, dated December 31, 1556, and September 25, 1565, and the ordinances of the Duke of Alva, dated September 21 and November 3, 1571 (Graswinckel, *Placcaetboeck*, 61, 74, 89).
37. For example, the ordinances on forwards and futures of 1565 and 1571 refer to "grain to buy and sell, to deliver at certain days . . . such as Christmas, Lightmas [February 2nd], Easter, and others" (Graswinckel, *Placcaetboeck*, 60, 89).
38. J.D. Tracy, "Habsburg Grain Policy and Amsterdam Politics: The Career of Sheriff Willem Dirkszoon Baerdes, 1542–1566," *The Sixteenth Century Journal* 14, no. 3 (1983): 293–319, at 316–317.
39. Van Dillen, "Termijnhandel te Amsterdam in de 16e en 17e eeuw," 507.
40. Graswinckel, *Placcaetboeck*, 75, 89–90; Cf. also the explicit reference to this concession in a draft of an advice of the Count of Savoye, to be sent to the Court of Holland (February 24, 1557) (Häpke, *Niederländische*, nrs. 800 and 801 (section 3). Our interpretation of the conflict differs from that of J.G. van Dillen ("Termijnhandel te Amsterdam in de 16e en 17e eeuw," 507–508) and M. van Tielhof (*De Hollandse graanhandel*, 218), for we believe the moment the Antwerp request appears in the administration of the Brussels government (February 1557) does not imply it was written at that time. In our view the documents in the government archives refer to proceedings on the substance of the matter.
41. Graswinckel, *Placcaetboeck*, 54–65, 71–79
42. C. van Bochove, "Haringvisserij in Holland, 1500–1795. Een kwantitatieve analyse" (master's thesis, Utrecht University, 2003).
43. N.W. Posthumus, *Nederlandse Prijsgeschiedenis*, 2 vols. (Leiden: Brill, 1964), vol. 1, 85; vol. 2, 127–131, 272–283, 658–659, 766; Cf. also additional prices collected by A.P. van Vliet, *Vissers en kapers. De zeevisserij vanuit het Maasmondgebied en de Duinkerker kapers (ca. 1580–1648)* ('s Gravenhage: Stichting Hollande Historische Reeks, 1994), 302–303.
44. To be sure, forward trading was not the only way for fishermen to manage the risk of their operations. Older strategies included the transfer of both the ownership of herring buses, and the finance of their voyages to consortia of merchants. H.A.H. Kranenburg, *De zeevisscherij van Holland in den tijd der Republiek* (Amsterdam: H.J. Paris, 1946), 59–71.

45. On the introduction of quality standards, see A. Beaujon, *Overzicht der geschiedenis van de Nederlandsche Zeevisscherijen* (Leiden: Brill, 1885), 33–47 and Kranenburg, *Zeevisscherij*, 159–160. Sayous, "Spéculation," 29, refers to Gerard Malynes' description of herring options in his *Consuetudo vel Lex Mercatoria* (first published in 1622). Meanwhile, it should be noted that the proceedings of a legal dispute carried before the local court of Rotterdam in 1599 mention that the lack of quality standards prevented forward transactions (Kranenburg, *Zeevisscherij*, 152).
46. R. Ehrenberg, *Zeitalter der Fugger, Geldkapital und Creditverkehr im 16. Jahrhundert*, vol. 1, *Die Geldmächte des 16. Jahrhunderts* (Jena: Fischer, 1896), 69–70. To be sure, merchants had the possibility to ask the local court (*Schepenbank*) to certify the quality of traded goods (Sayous, "Spéculation," 35). However, given the costs involved in this kind of legal procedure, it could never serve the lowering of information costs in everyday trade.
47. To be sure, the business correspondence of various merchants shows that by the middle of the sixteenth century, daily prices for a whole range of commodities were set at the Antwerp Exchange. Ehrenberg, *Zeitalter der Fugger*, 23, 123, 130–131; Van der Wee, *The Growth of the Antwerp Market*, 330. See also J.J. McCusker and C. Gravesteijn, *The Beginnings of Commercial and Financial Journalism* (Amsterdam: NEHA, 1991).
48. See the collection of ordinances on the trade in life necessities by Graswinckel, *Placcaetboeck*.
49. Graswinckel, *Placcaetboeck*, 61, 74, 89.
50. Swan, *Building the Global Market*, 134.
51. F.C. Lane, "The Funded Debt of the Venetian Republic, 1262–1482," in Braudel et al., *Venice and History*, 87–108, at 87–88; refers to G. Luzzato, *I prestiti della Repubblica di Venezia* (sec. xiii–xv) (Padua, 1929). A recent reconstruction, also building on the work of Luzzato, F. Lane and R. Mueller, *Money and Banking in Medieval and Renaissance Venice*, vol. 2, *The Venetian Money Market: Banks, Panics, and the Public Debt, 1200–1500* (Baltimore: John Hopkins, 1997).
52. On Genoa, see J. Heers, *Gênes au XVe siecle. Activité économique et problèmes sociaux* (Paris: S.E.V.P.E.N., 1961), 147–148.
53. Lane and Mueller, *Venetian Money Market*, 456, 464–465; Heers, *Gênes au XVe siecle*, 149.
54. Lane and Mueller, *Venetian Money Market*, 517–518, 555–558.
55. Lane and Mueller, *Venetian Money Market*, 458n, 476–477; Reinhold Mueller also refers to repeated attempts of the authorities to try and register what he describes as "speculative sales of government obligations on deferred payment" (519–520). However, on the face of it, these transactions may simply imply the buying of bonds on credit, rather than any kind of forward trading.
56. Lane and Mueller, *Venetian Money Market*, Mueller, 544–567; After 1450 the debt of the *Monte Vecchio* was gradually extinguished and replaced by voluntary loans to the Republic of Venice were made in the form of deposits in local banks that were not negotiable. See F.C. Lane, "Venetian Bankers, 1496–1533," in *Venice and History: The Collected Papers of Frederic C. Lane*, ed. F. Braudel et al. (Baltimore, 1966), 69–86, at 82–83.
57. On Antwerp, see F.J. van den Branden, ed. "De Spaansche muiterij ten Jare 1574," *Antwerpsch Archievenblad* XXII (1885), 133–480. On various towns in Holland, see J.D. Tracy, *A Financial Revolution in the Habsburg Netherlands: Renten and Renteniers in the County of Holland, 1515–1565* (Berkeley, 1985); and W. Fritschy, "A 'Financial Revolution' Reconsidered: Public Finance in Holland during the Dutch Revolt, 1568–1648," *Economic History Review* 56, no. 1 (February 2003), 57–89.
58. On the limited circle of creditors for Dutch bonds, see M.C. 't Hart, "Public Loans and Money Lenders," *Economic and Social History in the Netherlands* 1 (1989), 119–139.
59. For a detailed analysis of the finance of the first phase of Dutch colonial expansion, see Gelderblom and Jonker, "Completing a Financial Revolution."
60. Van Dillen, 'Isaac le Maire'; Smith, *Tijd-affaires*, 42–43; For a reconstruction of speculative trade by other merchants: Gelderblom and Jonker, "Completing a Financial Revolution."
61. Van Dillen, "Isaac le Maire," 20–21.
62. Cf., for instance, Van Dillen, "Isaac le Maire," 46–47, 78–83, 89–91.
63. Van Dillen, "Isaac le Maire," 68–69.
64. J.G. van Dillen, *Van rijkdom en regenten, handboek tot de economische en sociale geschiedenis van Nederland tijdens de Republiek* (The Hague: Nijhoff, 1970), 454, quoting the etiquette of traders branding such a call on the 1636 ban as infamous. Cf. also Ehrenberg, "Die Amsterdamer Aktienspekulation im 17. Jahrhundert," 812.
65. Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 57–59, 87–88: De Marchi and Harrison, "Trading 'in the Wind' and with Guile."
66. On the WIC in general, see H. den Heijer, *De geschiedenis van de WIC* (Zutphen: Walburg Pers, 1994).
67. J.G. van Dillen, "Effectenkoersen aan de Amsterdamsche beurs 1723–1794," *Economisch-Historisch Jaarboek* 17 (1931): 1–46, at 9.

68. Amsterdam City Archives (ACA), Notarial Archives (NA), card index: NA 664/17, fol. 41–42v (20-03-1630), fol. 62–63v (27-03-1630), fol. 106v (17-04-1630), fol. 111 (18-04-1630), fol. 112v (17-04-1630), fol. 118v (22-04-1630), fol. 164v (15-05-1630); NA 827, fol. 137 (10-04-1630), fol. 159 (05-06-1630); NA 991/3, fol. 44 (01-10-1633); NA 409, fol. 348 (26-04-1634); NA 418b, fol. 502 (10-12-1638); NA 930, fol. 122 (14-02-1634).
69. ACA NA 1076/86v.
70. The notarial card index of Amsterdam's city archives holds references to 138 forward contracts signed between 1607 and 1650. Out of 110 forwards concluded between 1607 and 1610 there were only six contracts that stipulated delivery within six months. Another forty contracts were for delivery between eight and twelve months, while the largest part was for delivery within two years (thirty-six contracts), or even three years (twenty-seven contracts). By contrast, out of twenty-two contracts signed between 1635 and 1650, sixteen were for delivery within six months, while the remaining six contracts matured within one year. *Nota bene*, for the years between 1610 and 1635 only six contracts have survived. A similar trend toward shorter terms is visible from contracts for the future delivery of WIC shares registered by Amsterdam notaries between 1629 and 1650. Out of thirty-six contracts concluded between 1629 and 1639, nine specified delivery within six months, twenty-four delivery within one year, and three delivery within two years. Out of thirty-six contracts written between 1640 and 1650, twenty-four specified delivery within six months, and twelve delivery within one year (Amsterdam City Archives, Notarial Card Index).
71. There are seven price quotations for December 1640 (ACA, NA 1093 fol. 160, 11-02-1650), five for April–May 1644, and four for December 1649 (Van Dillen, "Effectenkoersen," 10–11).
72. ACA 366/1288, fol. 1, 5v, 7v, 8, 8v. An earlier case of an interloper in the stock trade, in December 1633, merely concerned the son of a broker who had not yet become a member of the guild (ACA 366/1287, fol. 89).
73. Noordkerk, *Handvesten*, II, 1063
74. ACA Card Index NA, 1609/19–20, 11-05-1639. Also, NA 899/93–106, 14-02-1648. Note that Smith (*Tijdaffaires aan de Amsterdamsche beurs*) has dated this innovation in the 1670s.
75. *Den loosen handel van de Actionisten die dobbele partijen maacken of action beleene, en, de beleende panden wederom verscheyde malen verkoopen, tot uytsuygingh en ruïne des eygenaars* (1642) (Royal Library, The Hague, Collection Knuttel Pamphlets, nrs. 4890, 4891).
76. Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 61. In the 1689 ordinance of Amsterdam's brokers' guild options and *beleeningen* were referred to as similar techniques (Noordkerk, *Handvesten*, II, 1070–1071).
77. Noordkerk, *Handvesten*, II, 1063.
78. Van Dillen, *Van rijkdom en regenten*, 454, gives no date but suggests some time around 1650. Cf. also Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 92–101; Ehrenberg, "Die Amsterdamer Aktienspekulation im 17. Jahrhundert," 812. The exact contribution to these innovations of the growing number of Portuguese Jewish stockbrokers remains unknown; cf. Sayous, "Spéculation," 34; J.I. Israel, "The economic contribution of Dutch Sephardic Jewry to Holland's Golden Age, 1595–1713," *Tijdschrift voor Geschiedenis* 96 (1983): 505–535, reprinted in J.I. Israel, *Empires and Entrepots: The Dutch, the Spanish Monarchy, and the Jews, 1585–1713* (London, 1990), 417–448.
79. Cf., for the introduction of new credit techniques following the establishment of the VOC, Gelderblom and Jonker, "Completing a Financial Revolution."
80. In the registers of the Amsterdam chamber of the VOC twenty-three transactions of shares by Hans Thijs and his heirs are reported between 1609 and 1612 (DNA 1.04.02 Inv. Nr. 7066, fol. 152, 156, 158, 159, 163, 197, 200, 202, 203, 204, 205, 246, 253, 303, 304, 308, 322). In addition, the business ledgers of Hans Thijs reveal several transactions of shares in the VOC chambers of Middelburg, Rotterdam, and Enkhuizen (University of Leiden, Biblioteca Thysiana, Inv. Nr. 119 *Ledger Hans Thijs 1603–1609*, fol. 143, 207, 209, 222, 223; Also BT 113, *Journael E*, Inventory of the estate of Hans Thijs). The card index to Amsterdam's notarial archives, otherwise exhaustive when it comes to the trade in VOC shares before 1612, does not hold a single reference to stock transactions of Hans Thijs or his relatives. For a detailed reconstruction of the organization of the trade of Hans Thijs between 1585 and 1611, see O. Gelderblom, "The Governance of Early Modern Trade: The Case of Hans Thijs (1556–1611)," *Enterprise and Society* (2003–2004): 606–639. For his trade in VOC shares, Gelderblom and Jonker, "Completing a Financial Revolution."
81. The forward contract: BT 112/c2 (26 August 1611); the future contract: BT 112/c2 (December 10, 1610). Besides, Thijs's papers contain several written and printed transfer deeds of shares issued by the VOC. The oldest transfer deeds are three printed forms for the transfer of VOC shares in the VOC chamber of Enkhuizen, dated August 27, 1604 (twice), and July 11, 1616. There are also two written transfer deeds from the same chamber, dated February 22, and August

19, 1611. Finally, there is a printed transfer deed, from the Amsterdam chamber of the company, for a share bought by Thijs on December 9, 1610 (BT 112, c2)

82. For a similar sale of a forward contract, completed before an Amsterdam notary, see ACA NA 707/908, 01-11-1630.
83. The exact wording was: "t'oorconde der waerheyt syn hier affgemaeckt, twee alleensluydende contracten, wtten anderen gesneden door A B C D ende by parthyen respective onderteeckent, daervan elcx eeen heeft." (BT 112/c2, nr. 5).
84. ACA NA 196/480, 05-05-1610; cf. also Van Dillen, "Isaac le Maire," 92–93.
85. On the transfer of notarized and private contracts, see Van Dillen, "Isaac le Maire," 78–83, 89–91, 92–93, 100.
86. Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 57–59. The contracts are held in the Amsterdam town record office. One of them may be seen at http://gemeentearchief.amsterdam.nl/schatkamer/index.nl.html. It was published in facsimile by Van Dillen, "Isaac le Maire," 12–13).
87. A.E. Sayous, "La liquidation des marchés à terme sur marchandise en Hollande entre 1675 et 1725," *Nouvelle Revue d'histoire du Droit* 25 (1901): 767–773; the oldest reference to clearing (*rescontreren*) in Amsterdam's local customs dates from 1635 (Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 6n).
88. For example, in February 1611 Hans Thijs had bought a share of 9,000 guilders from Jan Brouwer, part of which he immediately resold to a third party. Brouwer agreed to deduct a payment promised by this third party from his claim on Hans Thijs, "as if it had already been paid to him" (BT 112/c2).
89. Joh. C. Breen, *Rechtsbronnen der stad Amsterdam* (The Hague: Nijhoff 1902), pp. 395-399 (26 August 1502).
90. W. Gijsbers, *Kapitale Ossen. De internationale handel in slachtvee in Noordwest-Europa (1300-1750)* (Hilversum: Verloren 1999), 40–41.
91. Van Dillen, "Isaac le Maire," 20, 22.
92. J.I. Israel, *Dutch Primacy in World Trade* (Oxford: Oxford University Press, 1989), 74.
93. The Amsterdam notarial records hold many deeds in which brokers testify about share prices; the earliest known is ACA NA 336/15, July 11, 1613.
94. On the obligation of brokers to keep records of their transactions, see Noordkerk, *Handvesten*, 1060–1074. When the Amsterdam Exchange opened its doors in 1611, it had rooms for meetings of merchants and brokers. In 1632 the brokers' guild built a new guild house, which had a meeting room on the first floor. Th. Stuart, *De Amsterdamse makelaardij: bijdrage tot de geschiedenis onzer handelswetgeving* (Amsterdam, 1879), 52–53. "Es gab Makler, welche 'rescontrantes' hießen, weil sie es übernahmen, die Partien nach Möglichkeit gegeneinander auszugleichen, die Differenzen [surpluses] einzukassieren und auszuzahlen" (Ehrenberg, "Die Amsterdamer Aktienspekulation im 17. Jahrhundert," 819). For the 1739 agreement about settling options, see Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 126–129.
95. ACA NA 335/130, 10-09-1612; ACA NA 197/512v, 15-03-1613; DNA 1.04.02 Inv. Nr. 7066, fol. 203, 208, 305, 325, 330; cf. also Van Dillen, "Isaac le Maire," 90, 95, 100. At various occasions brokers appeared before a notary to describe current market conditions. See, for example, ACA NA 336/15; 11-07-1613; ACA NA 694b/ omslag 60, 21-02-1634; ACA NA 1059/13, 19-12-1640.
96. Ehrenberg, "Die Amsterdamer Aktienspekulation im 17. Jahrhundert," 825; Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 47. The deed ACA NA 336/15, July 11, 1613, specifically refers to the witnesses appearing as stock brokers.
97. Isaac Florianus, admitted 27 Januari 1612 (ACA 366/1071, fol. 71; also NA 197/512v); Jacques (van) de Geer, admitted 27 Januari 1612 (ACA 366/1071, fol. 71; also NA 335/130); Pieter van Haren, 06-02-1612 (ACA 366/1071, fol. 133; also NA 336/15); Reijnier Lems, the former bookkeeper of Lemaire's syndicate, was admitted 27 July 1613 (ACA 366/1071, fol. 147; also Van Dillen, "Isaac le Maire.")
98. Statement by Isaac Florianus, 26-08-1611 (BT 112/c2).
99. Lane and Mueller, *Venetian Money Market*, 571
100. De Groot, *Zeeassurantie*, 133.
101. Gelderblom, "The Governance of Early Modern Trade."
102. The most recent overall description is Dash, *Tulipomania*; Dr. Anne Goldgar of King's College, London, is preparing a major reassessment of the phenomenon. Cf. also Krelage, *Bloemenspeculatie in Nederland, de Tulpomanie van 1636–1637*; Krelage, "Het manuscript over den tulpenwindhandel uit de verzameling-Meulman;" and Posthumus, "De speculatie in tulpen in de jaren 1636 en 1637." The Tulip saga continues to run and run: in August 2004, an investment fund set up to finance the development of new bulb varieties by engaging in forward trading announced that it would be unable to pay the promised returns on the 85 million euros put up by wealthy investors. The fund di-

rectors accused their counterparts of plain fraud and asked the police to investigate: *Het Financieele Dagblad*, August 25, September 1, 2004.

103. The workings of the trading clubs is explained by Posthumus, "Speculatie," I, 12–17.
104. Cf., for instance, Posthumus, "Speculatie," I, 11–15; Dash, *Tulipomania*, chap. 10; Krelage, *Bloemenspeculatie*, 70–72.
105. We will focus our analysis on the trading techniques in the market for tulips. There is also a case for the normality of the tulip prices. Peter Garber has argued convincingly that the price rises in the tulip market were a normal phenomenon given that a host of new varieties of tulips appeared on the market: P.M. Garber "Tulipmania," *The Journal of Political Economy* 97, no. 3 (1989), 535–580. Marina Bianchi recently argued that prices remained high for the pleasure people derived from the neverending appearance of new variations: M. Bianchi, "In the Name of the Tulip: Why Speculation?" in *Consumers and Luxury: Consumer Culture in Europe 1650–1850*, M. Berg and H. Clifford (Manchester: Manchester University Press, 1999), 88–102.
106. Van Dillen, *Rijkdom*, 454.
107. Posthumus, "Tulpenspeculatie," II, 5.
108. Krelage, *Bloemenspeculatie*, 95–96.
109. Posthumus, "Tulpenspeculatie," II, 5–11. A meeting of bulb producers and traders from all over Holland on February 24, 1636, had already voted to adopt such an arrangement with a premium of 10 percent. Only the Amsterdam delegation had voted against, for reasons unknown: perhaps they found the percentage too high.
110. Smith, *Tijdaffaires aan de Amsterdamsche beurs*, 72–83; the regulation in Noordkerk, *Handvesten*, 1070–1071.
111. The earliest specimen of an options contract known is an Antwerp document from 1729. A facsimile of this document is published in G. de Clercq, ed., *Ter Beurze, geschiedenis van de aandelenhandel in België, 1300–1990* (Brugge: Van de Wiele, s.d.), 125.

CHAPTER 12. ANNUITIES IN EARLY MODERN EUROPE

I am grateful to Casey Rothschild for outstanding research assistance, to Kenneth Arrow, Jonathan Ingersoll, Larry Neal, Luciano Pezzolo, and Geert Rouwenhorst for helpful discussions, and to the National Institute of Aging and the National Science Foundation for research support.

1. See, for example, Edmund Halley, "An Estimate of the Degrees of Mortality of Mankind, Drawn from the Curious Tables of the Births and Funerals at the City of Breslaw, with an Attempt to Ascertain the Price of Annuities upon Lives," *Philosophical Transactions* (1693), 596–656; Abraham de Moivre, *Annuities upon Lives, or, the Valuation of Annuities upon Any Number of Lives* (London: Fayram, Motte, and Pearson, 1725); and Nicholas Bernoulli, "De Usu Artis Conjectandi in Jure," 1709, reprinted in *Die Werke von Jakob Bernoulli*, vol. 3 (Basel, Birkhauser, 1975), 387–26.
2. See George Alter and James C. Riley, "How to Bet on Lives: A Guide to Life Contingent Contracts in Early Modern Europe," *Research in Economic History* 10 (1986): 1–53; and Geoffrey Poitras, *The Early History of Financial Economics, 1478–1776* (Cheltenham, England: Edward Elgar, 2000).
3. Marquis James, *The Metropolitan Life: A Study in Business Growth* (New York: Viking Press, 1947).
4. Ray D. Murphy, *Sale of Annuities by Governments* (New York: Association of Life Insurance Presidents, 1939).
5. Murphy, *Sale of Annuities by Governments*.
6. James D. Tracy, *A Financial Revolution in the Habsburg Netherlands* (Berkeley: University of California Press, 1985).
7. Tracy, *A Financial Revolution in the Habsburg Netherlands*.
8. Lorraine J. Daston, "The Domestication of Risk: Mathematical Probability and Insurance, 1650–1830," in *The Probabilistic Revolution*, vol. 1, *Ideas in History*, ed. Lorenz Kruger, Lorraine Daston, and Michael Heidelberger (Cambridge: MIT Press, 1987), 237–259.
9. Tracy, *A Financial Revolution in the Habsburg Netherlands*.
10. Murphy, *Sale of Annuities by Governments*.
11. Jan de Witt, *Value of Life Annuities in Proportion to Redeemable Annuities* (Amsterdam, 1671).
12. This is presented in Jeffrey R. Brown, Olivia S. Mitchell, James M. Poterba, and Mark J. Warshawsky, *The Role of Annuity Markets in Financing Retirement* (Cambridge: MIT Press, 2001), which also includes many references to recent research on the annuity market.
13. De Witt, *Value of Life Annuities*.
14. The data from this annuity offering underlies the calculations by Alter and Riley. See "How to Bet on Lives."
15. Halley, "An Estimate of the Degrees of Mortality of Mankind."
16. John Graunt, *Natural and Political Observations Mentioned in a Following Index and Made upon the Bills of Mortality* (London: John Martin, 1662).

17. De Moivre, *Annuities upon Lives.*
18. Poitras, *The Early History of Financial Economics.*
19. Alter and Riley, "How to Bet on Lives."
20. See, for example, Thomas Simpson, *The Doctrine of Annuities and Reversions Deduced from General and Evident Principles* (London: John Nourse, 1742), which expanded on de Moivre's work and offered superior approximations for a number of problems, including the valuation of joint life annuities. See also Anders Hald, *A History of Probability and Statistics and Their Applications Before 1750* (New York: John Wiley & Sons, 1990), for a summary of these developments that places them in the broader context of the emerging field of probability theory.
21. Alter and Riley, "How to Bet on Lives."
22. David R. Weir, "Tontines, Public Finance, and Revolution in France and England, 1688–1789," *Journal of Economic History* 49 (March 1989): 95–124; Francois Velde and David Weir, "The Financial Market and Government Debt Policy in France, 1746–1793," *Journal of Economic History* 52 (March 1992): 1–39.
23. Velde and Weir, "The Financial Market and Government Debt Policy in France."
24. Alter and Riley, "How to Bet on Lives."
25. Weir, "Tontines, Public Finance, and Revolution in France and England," documents ten issues of French tontines between 1689 and 1759. A number of studies chronicle the experience of the French government with tontine finance. See, for example, Robert M. Jennings and Andrew P. Trout, *The Tontine: From the Reign of Louis XIV to the French Revolutionary Era* (Homewood, Illinois, 1982).
26. Alter and Riley, "How to Bet on Lives."
27. Jennings and Trout, *The Tontine.*
28. Antoine Deparcieux, *Essai sur les Probabilities de la Duree de la Vie* (Paris: Preres Guerin, 1746).
29. Francis Leeson, *A Guide to the Records of the British State Tontines and Life Annuities of the Seventeenth and Eighteenth Centuries* (London: Pinhoms, 1968), offers a detailed summary of English life annuity sales beginning with the simultaneous sale of tontines and annuities in 1693.
30. Leeson, *A Guide to the Records of the British State Tontines and Life Annuities.*
31. John Finlaison, *House of Commons: Parliamentary Papers*, March 31, 1829.
32. Ray D. Murphy, *Sale of Annuities by Governments* (New York: Association of Life Insurance Presidents, 1939).
33. Casey G. Rothschild, "Adverse Selection in Public Finance: Life-Contingent Contracts in Early Modern Europe" (mimeo, MIT Department of Economics, 2003).
34. J. Francis, *Annals, Anecdotes, and Legends: A Chronicle of Life Assurance* (London, 1853).
35. Rothschild, "Adverse Selection in Public Finance."
36. James, *The Metropolitan Life.*
37. Mark Warshawsky, "Private Annuity Markets in the United States, 1919–1984," *Journal of Risk and Insurance* 40 (September 1988): 518–528, provides historical evidence on annuity pricing, as well as some discussion of the evolution of the private annuity market in the United States during the last century.
38. James, *The Metropolitan Life.*
39. James, *The Metropolitan Life.*
40. Louis Dublin, *A Family of Thirty Million: The Story of the Metropolitan Life Insurance Company* (New York: Metropolitan Life, 1943).
41. Richard Price, *Observations on Reversionary Payments* (Dublin: James Williams, 1772).

CHAPTER 13. JOHN LAW: INNOVATING THEORIST AND POLICYMAKER

1. J. Keith Horsefield, *British Monetary Experiments 1650–1710* (Cambridge, Mass.: Harvard University Press, 1960).
2. John Law, *John Law: Oeuvres Complètes*, ed. Paul Harsin (Paris: Sirey, 1934; reprint Vaduz, 1980), i, 100.
3. John Law, in *John Law's Essay on a Land Bank*, ed. Antoin E. Murphy (Dublin: Aeon Publishing, 1994), 77.
4. John Law, *Money and Trade Consider'd with a Proposal for Supplying the Nation with Money* (Edinburgh: Anderson, 1705), 104.
5. Milton Friedman, *Studies in the Quantity Theory of Money* (Chicago: Chicago University Press, 1956), 4.
6. Richard Cantillon, *Essai sur la nature du commerce en général* (Paris, 1755).
7. Edgar Faure, *La Banqueroute de Law* (Paris: Gallimard, 1977).
8. Law, *John Law's Essay on a Land Bank*, 63.
9. Antoin E. Murphy, *John Law Economic Theorist and Policy-Maker* (Oxford: Oxford University Press, 1997).

10. John Law, *John Law: Oeuvres Complètes.*
11. Ibid., iii, 344.
12. Ibid., iii, 378.
13. Nicolas Du Tot, *Histoire du Système de John Law*, ed. Antoin E. Murphy (Paris: INED, 2000).
14. Law, iii, 98–99.
15. Antoin E. Murphy, *Richard Cantillon Entrepreneur and Economist* (Oxford: Oxford University Press, 1986).
16. Nicolas Du Tot, *Réflexions politiques sur les finances et le commerce* (1738; reprint, ed. Paul Harsin, Paris, 1935), 1, 106.

CHAPTER 14. THE INVENTION OF INFLATION-INDEXED BONDS IN EARLY AMERICA

The author is indebted to Ned Downing and Jason Zweig for helpful discussions.

1. Of course, it is not absolutely known that this is the *first* indexed bond. Willard Fisher, who studied these Massachusetts bonds extensively, wrote "It is by no means impossible that a story of similar monetary or fiscal policy may lie hidden in the records of other states whose early histories have not been studied as much as the history of Massachusetts. There certainly was no little endeavor for harmonious action among the New England states in matters of financial policy." See Willard C. Fisher, "The Tabular Standard in Massachusetts History," *The Quarterly Journal of Economics* 27 (3) (May 1913): 417–54, at 448. Fisher points out that Governor George Clinton of New York (the uncle of the later, and now more famous, New York Governor DeWitt Clinton) expressed interest in the Massachusetts indexed bonds in 1780. According to William G. Anderson, *The Price of Liberty: The Public Debt of the American Revolution* (Charlottesville: University of Virginia Press, 1983), 145, New Hampshire issued a 1780 certificate with a 6 percent coupon that "has the same commodity price provision" as the Massachusetts soldiers' depreciation notes. By extension, we can easily imagine that the Massachusetts experience derives from imitation or extension of some now forgotten earlier example.
2. "Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back." John Maynard Keynes, "The General Theory of Employment, Interest and Money," in *The Collected Writings of John Maynard Keynes* (London: Macmillan, 1973), 383.
3. Adam Smith wrote, "Labour, it must always be remembered, and not any particular commodity or set of commodities, is the real measure of the value of silver and of all other commodities." *The Wealth of Nations*, Nicholson's edition, p. 79. This passage indicates an awareness of the possibility of indexation. In "Landmarks in the History of Index Numbers," appendix I of *The Making of Index Numbers*, vol. 7, *The Works of Irving Fisher*, ed. William J. Barber, (1927; reprint London: Pickering and Chatto, 1997), 506, Irving Fisher points out a couple of earlier examples that might be considered index numbers of sorts, such as Carli's 1764 comparison of price levels in 1500 and 1750 in terms of a simple average of the prices of grains, wine, and oil.
4. See John Y. Campbell and Robert J. Shiller, "A Scorecard for Indexed Government Debt," in *NBER Macroeconomics Annual*, ed. Ben Bernanke and Julio Rotemberg (Cambridge, Mass.: MIT Press, 1996), 155–197.
5. One lively source of debate that arose is whether the government should ultimately pay the notes in full, when the benefit accrues to the "speculators" who bought the notes at a discount, rather than the soldiers who sacrificed for their country. A leading economist of the time, Pelatiah Webster, argued strongly for paying the notes in full. See Peletiah Webster, *Political Essays on the Nature and Operation of Money, Public Finances and Other Subjects, Pub. During the American War, and Continued up to the Present Year, 1791* (Philadelphia: Joseph Crukshank, 1791).
6. William B. Shirley, *Report to the Board of Trade Boston, December 23, 1743*, as quoted in John Gorham Palfrey, *History of New England* (Boston: Little, Brown & Co., 1890). Proclamation money refers to an amount of Spanish milled dollars corresponding to the pound sterling as prescribed in a proclamation of Queen Anne in 1704.
7. Quoted in Joseph B. Felt, *An Historical Account of Massachusetts Currency* (Boston: Perkins & Marvin, 1839), 180–81.
8. Such an index would be dictated by a model that asserts that each commodity has a price proportional to an aggregate price level plus an error which is independent of all other commodities. Such a model resembles that of the repeat-sales price indexes for individual homes. See Martin J. Bailey, Richard F. Muth, and Hugh O. Nourse, "A Regression Method for Real Estate Price Index Construction," *Journal of the American Statistical Association* 58 (1963): 933–42; or its arithmetic counterpart, Robert J. Shiller, "Arithmetic Repeat Sales Price Estimators," *Journal of Housing Economics* 1 (March 1991): 110–26.

9. Quoted in Willard C. Fisher, "The Tabular Standard in Massachusetts History," *The Quarterly Journal of Economics* 27 (3) (May 1913): 417–54, at 447. From Massachusetts Archives, 237, p. 477.

CHAPTER 15. THE ORIGINS OF MUTUAL FUNDS

I would like to thank William Goetzmann, Carol Ross, Nettie Stoppelenburg, and Roberto Wessels for their help in preparing this chapter.

1. Investment Company Institute Mutual Fund Factbook reports more than 8,000 mutual funds in the U.S. in 2002, compared to 2,800 firms listed on the NYSE.
2. See L. Neal, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge: Cambridge University Press, 1990).
3. J. Riley, *International Government Finance and the Amsterdam Capital Market, 1740–1815* (Cambridge: Cambridge University Press, 1980), points out that this term has no direct counterpart in the modern English language. In eighteenth century Holland, it applied to any investment undertaking organized and managed by a financial intermediary which sold shares to the general public.
4. D. Houtzager, "Hollands Lijf- en Losrenteleningen voor 1672" (diss., Schiedam, 1950), 12.
5. H. Wagenvoort, "Tontines: Een onderzoek naar de geschiedenis van de liifrenten bij wijze van tontine en de contracten van overleving in de Republiek der Verenigde Nederlanden" (diss., Utrecht, 1961), 145.
6. Wagenvoort, "Tontines," 127.
7. W. H. Berghuis, "Onstaan en Ontwikkeling van de Nederlandse Beleggingsfondsen tot 1914" (diss., Assen: Van Gorcum & Company, 1967). A 1773 plan for similar investment trust organized in Utrecht has survived, but it is not known whether it was ever successfully placed on the market.
8. This translates into an annual management fee of 0.2 percent of assets, which is low even by modern standards.
9. Many of the plantation loans paid interest at a rate of 6 percent per annum, Russian and Swedish bonds offered 5 percent, and the Danish tolls 4 percent per annum.
10. The lottery creates what is often referred to as "path dependence" to the valuation of each share. To see this, consider the value of shares 52 and 53 in the previous example after redemption of the two shares. Both continue to earn the statutory dividend of 4 percent. However, No. 52 is a more attractive investment—and should therefore sell at a higher price—because redemption of its "left" neighbor would increase its dividend by 4.5 per cent, compared to an increase of only 2 percent for No. 53. To further complicate the valuation, if the order in which the shares are redeemed were reversed in the example, and No. 49 was retired before No. 50, shares No. 48 and 51 would earn 9 percent and 7 percent, respectively, thereby lowering the value of share No. 52. At first glance, it would seem that all shares had equal value at the inception of the fund. Article I of the prospectus states that shares of "all classes are mutually combined," and Article IV specifies that "the first share of the first class and the last share of the last class are understood to be consecutive." Given that one share would be retired from each class annually, the first and last shares of a class had the opportunity to benefit from simultaneous share retirements of both neighbors, one being a member of their own class, and one from the adjacent class. Because shares in the middle of a class did not have this advantage, shares close to the border of a class are more valuable ex-ante.
11. Koninklijke Bibliotheek The Hague, catalogus Knuttel, no. 19132.
12. "Concordia res parvae crescunt, discordia maximae dilabuntur" is attributed to the Roman historian Sallust, meaning "In harmony small things grow, dissension dissolves the greatest."
13. Berghuis, pp. 62–68.
14. P. J. Van Winter, *Amsterdam en de opbouw van Amerika*, 2 vols. ('s-Gravenhage: Martinus Nijhoff, 1933), appendix 4.
15. This was certainly not the first office of administration. According to K.D. Bosch, *Nederlandse Beleggingen* in de Verenigde Staten, Elsevier, Amsterdam, Brussels (1948), this particular firm emerged from the firm of N.&J.&R. Van Staphorst, Ketwich & Voomberg and W. Borski, which was formed in 1805. According to Riley, *International Government Finance and the Amsterdam Capital Market*, Van Ketwich partnered in an administration office investing in French annuities as early as 1802.
16. H. Bullock, *The Story of Investment Trusts* (New York: Columbia University Press, 1959).

CHAPTER 16. TRANSATLANTIC PAPER AND THE EMERGENCE OF THE AMERICAN CAPITAL MARKET

I have enjoyed nearly a lifetime of collecting and researching early American financial history. My primary impetus came when, as a young stockbroker, I realized that the first securities to trade on what is now the New York Stock Exchange were those three classes of stock exchanged for the Revolutionary War debt according to Alexander Hamilton's 1790 plan. When I realized how little was known about the subject it became my passion and avocation. I have been fortunate to hold

and study most of the rare transatlantic financial instruments included in this illustrated study. It is a pleasure to be able to share my findings with you.

1. One book, William Anderson, *The Price of Liberty: The Public Debt of the American Revolution* (Charlottesville: University Press, 1983), attempts to compile all of the relevant transatlantic financial instruments into a larger theme of the fiscal paper used by states and Congress to finance the American Revolution. After over 200 years of obscurity, Anderson's groundbreaking effort to define the financial instruments used to finance and refinance the Revolution provides a foundation for further study of the transatlantic paper. William Sumner has an interesting chapter on the bills on foreign envoys in *The Financier and the Finances of the American Revolution*, 2 vols (1891; Ben Franklin reprint, New York, 1970). See also Mary A. Giunta et al., *The Emerging Nation: A Documentary History of the Foreign Relations of the United States under the Articles of Confederation, 1780–1789*, 3 vols. (National Historical Publications and Records Commission, 1996), which compiles the relevant transatlantic correspondence that best illuminates the usage of these financial instruments. This fine compendium makes available for the first time translations of many important foreign language letters and documents and provides a fresh foreign perspective into the budding American financial relations that formed in the early American period.
2. Final settlement certificates were the approximately $17 million of 6 percent securities given to Revolutionary War debt claimholders by the states' and United States' settlement agents upon a valuation of claims agreed upon by the parties involved—also called "liquidated debt securities" and "finals." In the 1783–1789 period, when interest was paid on these "finals" it was usually in paper indents, themselves of unproven and dubious value. Investors in "finals" had to rely on annual appropriations to receive any interest and no provision was made for a payoff of the principal until Treasury Secretary Alexander Hamilton's plan to restore the public credit was implemented in 1789–1793 and the resulting securities paid their interest and principal payments off in cash. Also see note 75.
3. Continental Loan Office Certificates were the first debt issued by all of the original thirteen states. They formed the second largest corpus of tradable securities available behind the "finals" in the 1783–1789 period.
4. Eighteenth-century security price quotes are a major stumbling block for understanding American financial history. Security prices were generally quoted as a number of shillings and pence on the pound in eighteenth-century America-the security language of the mother country. A quote expressed as "20/" equaled par or 100 percent (20/20). At 20 shillings to the pound each shilling added or subtracted 5 percent of value. Since there were 12 pence in a British shilling each pence was worth 5 x 1/12, or .417 percent so a price of "20/1" equaled 100.417 percent. A quote of "4/6" for a $150 6 percent final settlement certificate just before Alexander Hamilton took office as secretary of the treasury meant the certificate had a 20 (4 x 5) + 2.5 (6 x 5/12), or 22.5 percent x $150, or $33.75 market value. The merging of the time hardened pounds, shillings, and pence colonial methodology with the dollar-based official book keeping methods of the United States produced confusion among both the public at the time and for historians studying the period. In 1791 Massachusetts, for instance, Treasury books for their February 23, 1791, loan (now in the Massachusetts Archives) were kept side by side in the time honored pounds, shillings, and pence and also in the anomaly of "Dollars and Pence." Then there were 72 pence Massachusetts lawful money in a Spanish milled dollar. In Pennsylvania, the state whose currency had the most support, there were then 90 pence to the Spanish milled dollar. The modern American decimal system of coinage was not applied to the Spanish milled dollar until large cents at 100 to the dollar were coined for circulation in 1793 by authority of the April 2, 1792, mint Act. Thus, the American dollar grew into its present form.
5. A financial scandal broke out in Holland in 1790 when it was disclosed that the *Wisselbank*, established in 1609, had been making large loans to insiders—contrary to the bank's promise of holding every cent deposited in cash. The subsequent liquidation of bank money credits produced substantial losses for depositors and a search for alternative investments, which they found by using low-priced American securities and eventually large tracts of American real estate.
6. Edmund Cody Burnett, *The Continental Congress* (New York: The Macmillan Company, 1941), 35–39.
7. Continental currency was designed to be paper money for general circulation to pay for the war expenses in the thirteen original colonies, a bill of credit which was a security because it promised repayment in the future in silver. It initially gained a currency among the public not only because of its stated security but also, and perhaps even more so, because of the support of its users for the Revolutionary cause.
8. Georgia was not yet represented at Continental Congress.
9. Specifically, all in $30 denominations.
10. Burnett, *The Continental Congress*, 101–2.

11. Burnett, *The Continental Congress*, 249–51. In fact, because of the uncertainty, confusion, and lack of a responsible expense-allocating plan going forward, the final settlement of the Revolutionary War debt was delayed until June 29, 1793. In the interim period, citizens were subjected to injustices due to the inept financial policies and lack of cooperation between the states and Congress.
12. Once confidence was lost in finances it took two changes of government—Confederation (1781) and Constitution (1787)—and the 1790–1793 implementation of Treasury Secretary Alexander Hamilton's well-conceived plan to restore the public credit to regain that confidence.
13. The Colony of Massachusetts Bay had previously authorized a 100,000 pound 6 percent two-year bond on May 3, 1775, to finance its part in the Revolution. These were the first American securities—sometimes called King Philip bonds, so named for the portrait of the leader of the Wampanoag Indian that graces the left-hand border of the bond. Some say Paul Revere (the printer and engraver) included Philip's portrait to warn the king of England about what happens to despots who trample on the rights of American colonists. Philip had been assassinated one hundred years earlier by a band of revenge-seeking colonists seeking reprisals for earlier Indian attacks. Bond #1 was issued on May 20, 1775.
14. *Papers of Continental Congress, 1774–1789*, 34 vols. (Washington, D.C.: Library of Congress), vol. 5, p. 845.
15. E. James Ferguson, *The Power of the Purse* (Chapel Hill: University of North Carolina Press, 1961), 38.
16. See Susan Mary Alsop, *Yankees at the Court: The First Americans in Paris* (Garden City, N.Y.: Doubleday & Co., Inc., 1982), for the fascinating story of how the French became our nation's first diplomatic ally. Also for the almost forgotten but crucial role in American history played by Frenchmen Julien de Bonvolouir and Pierre Beaumarchais.
17. Giunta et al., *The Emerging Nation*, vol. 1, pp. 1–13.
18. Beaumarchais was the playwright for *The Barber of Seville* and *Figaro*.
19. William Graham Sumner, *The Financier and the Finances of the American Revolution*, 2 vols. (1891; Ben Franklin Reprint, New York, 1970), 159.
20. Francis A. Wharton, ed., *The Revolutionary Diplomatic Correspondence of the United States*, 6 vols. (Washington, D.C., 1889), vol. 2, p. 250.
21. The king took his advice concerning French involvement with the American patriot cause from a very small circle—primarily from Charles Gravier Comte de Vergennes, his minister of foreign affairs, and the Comte de Maurepas, his minister of state.
22. For Beaumarchais' role in financing the American Revolution see Alsop, Yankees at the Court, and the first twenty pages of Rafael A. Bayley's *The National Loans of the United States from July 4, 1776, to June 30, 1880, as Prepared for the Tenth Census of the United States* (Washington, D.C., 1882), where Beaumarchais' role is described repeatedly. Despite all efforts to keep French assistance from British discovery several spies within the American delegation advised British Ambassador Lord Stormont of the budding French/American alliance.
23. Wharton, *The Revolutionary Diplomatic Correspondence of the United States*, vol. 2, p. 286.
24. Anderson, *The Price of Liberty*, 87–88, ill. on p. 89. French specie was commonly circulated and universally accepted as a medium of exchange in the thirteen colonies.
25. From the face of any Continental Loan Office Bill of Exchange issued between October 1778 and March 1782.
26. Lyman Horace Weeks, *A History of Paper-Manufacturing in the United States, 1690–1916* (New York: The Lockwood Trade Journal Company, 1916), 55.
27. Anderson, *The Price of Liberty*, 87–88, ill. on p. 87.
28. See Robert C. Alberts, *The Golden Voyage: Life and Times of William Bingham (1752–1804)* (Boston: Houghton Mifflin, 1969), for the crucial role played by William Bingham, who returned from Martinique as America's first millionaire.
29. See E. James Ferguson et al., *The Papers of Robert Morris 1781–1784*, 9 vols. (University of Pittsburgh Press, 1975–1999), vol. 3, p. 66, for a description of the process for similar bills.
30. Pennsylvania Racket, April 1, 1781.
31. Independent Chronicle & Universal Adviser, June 4, 1778.
32. Pennsylvania Packet, December 28, 1781.
33. Pennsylvania Packet, August 24, 1782.
34. Haym Solomon first recognized a full-time profession in the opportunity created by the myriad of thinly traded Revolutionary War financial instruments. He parlayed his usefulness to the United States superintendent of finance Robert Morris into an official appointment as "broker to the office of finance" in July 1782 (Pennsylvania Packet, July 20, 1782). Then in a series of pathbreaking newspaper ads over the next several years he positioned himself distinctively as a three-language

securities dealer and commission merchant without peer seeking business from the public. Solomon was a Polish refugee who immigrated around the outbreak of the Revolutionary War to New York City, where he started a business as commission agent and broker. He was arrested twice in British occupied New York City for his role in helping the revolutionary American cause. In early 1777 he married Rachel Franks, daughter of the wealthy and influential Jewish merchant Moses B. Franks. After his second arrest he escaped and fled to Philadelphia. There he opened a brokerage office to specialize in the trading of the bills of exchange emitted by the United States as interest payments or to draw on foreign loans-simply called "exchange." His successful efforts at discovering markets for these bills of exchange at a discount in the United States prior to sending them off to Europe for collection brought him to the attention of Superintendent of Finance Robert Morris. Morris called on him for help no less than seventy-five times between August of 1781 and April of 1784. His help was instrumental in opening a regular foreign exchange market in the United States. His distinctive newspaper advertising campaign marks him as one of the first, if not the first, broker/dealers in U.S. securities. His untimely death in 1785 prevented his planned return to New York City as the country's leading securities dealer. John Pintard, a much less financially savvy commission merchant, seized the opportunity and became Wall Street's first full-time broker in 1790.

35. For political purposes Morris had stopped issuing CLOBOEs mid-1782 in order to focus investor pressure on the states to pay their taxes. This was the first outright default of a U.S. government bond. Morris continued, however, to access the French loans with his own customized bills of exchange. See Morris to Grand (Jan. 13, 1783) in Ferguson, *The Papers of Robert Morris*, vol. 7, p. 299.
36. Continental currency depreciated in value relative to cash/specie consistently during and after the Revolution. See Ferguson, *The Power of the Purse*, 32, for a table of depreciation from 1777–1781.
37. Ferguson, *The Power of the Purse*, p. 37.
38. After March 1, 1778, CLOCs continued to be offered that paid their interest in continental currency. These later dated CLOCs might trade at 5 to 10 cents on the dollar beside CLOCs dated before March 1, 1778, which might at the same time trade at prices 3 to 5 times as high. Holders of these specially issued CLOCs were among the few Revolutionary War security holders who refused to exchange their securities under the terms of Alexander Hamilton's 1790 plan to restore the public credit. They were eventually paid off at 100 cents on the dollar.
39. Sumner, *The Financier*, 169.
40. Alsop, *Yankees at the Court*, 217–18.
41. From John Jay's notes about a meeting with the Spanish minister Floridablanca in Giunta et al., *The Emerging Nation*, vol. 1, p. 117.
42. Sumner, *The Financier*, 250–55.
43. Charles A. Conant, *A History of Modern Banks of Issue* (1896; 6th ed. Agustus M. Kelley, New York, 1969), 287–89. Further study of the 1790 *Wisselbank* default and scandal might reveal interesting parallels (decline of Dutch trading preeminence) to the causes of the huge decline of stock prices in the 1999–2002 American capital market.
44. See Ned W. Downing, "Channeling Hamilton?" *Barron's* (July 28, 1998), 22, and Robert F. Jones, *William Duer King of the Alley* (Philadelphia: American Philosophical Society, 1992), for the best published accounts of the panic.
45. Alexander Hamilton to William Seton (March 22, 1792) unpublished ALS from the author's collection. From the fourth paragraph of a four-page letter: "Let credits be passed on your books in favor of the Depositors/or the amounts, according to those values, transferable at the Bank as in the case of deposits in the Bank of Amsterdam." Philip Livingston, who also received a never published letter from Hamilton dated March 22, replied on March 24, "Mr Julian Verplanck [President of the Bank of New York] seems disposed that the New York Bank should give every aid in their power consistent with safety, and on Tuesday they will assist the Dealers in some degree." Hamilton's plan was discussed positively by New York dealers. Seton wrote to Hamilton on March 26 that the New York dealers in stock had agreed not to draw any specie out of the banks for three months. On March 27, Philip Livingston wrote to Hamilton that "the dealers last night had a meeting. . . . The Propositions they hold out . . . is to offer funded debt [Stock in the Public Funds], at your price as pledges for their discounts-and they are to sign an agreement not to draw any specie from the Banks, . . . and in giving checks to each other, if any one, shall part with the check except to those, who engage by the agreement, not to draw out Specie, he shall be deemed, infamous-and held up-and that no one of the signers of the agreement will deal with him." On March 28 Daniel McConnick, the New York securities dealer wrote to William Constable (Constable Pierpont Papers, New York Public Library) that the Bank of New York reopened their lending window and started to "extend their loans on deposits being made of six Pcents @ 20/ 3% at 10 &

deferred @ 12/." He went on, "This will afford a great accommodation . . . [and] of course raise the price of stocks." This last letter that demonstrates the Bank of New York was attempting to put Hamilton's Stock in the Public Funds based 7 percent dealer credit facility into action. The loan values offered by the Bank of New York are identical to those suggested in Hamilton's March 22 letter to Bank of New York cashier William Seton.

On March 23, auctions were abandoned altogether as the public display of the almost totally illiquid market only served to increase the public's panic. On that date London's Register ran the following notice: "A meeting was held at Corre's Hotel on Wednesday last, March 21st, of the merchants and dealers in stocks, when they came to the resolution that on or after the 21st of April next they will not attend any sale of stocks at public auction, and they also appointed a committee to provide a proper room for them to assemble in, and to report such regulations relative to the mode of transacting their business as in their opinion may be proper."

It is clear that the auctioneer-based system of trading stocks, into which Wall Street's earliest market participants had organized themselves, had proved itself badly flawed. Auctioneers lacked the capacity to force defaulting traders to settle their trades. Key market participants like William Duer and Walter Livingston simply refused to settle rather than accept the losses involved. Under the laws of the day defaulters could simply transfer their assets to other family members rather than use the funds to settle a very unprofitable time bet or wager stock. Auctioneers also could not adequately determine their client's capacity to settle trades undertaken, because they had no way of knowing where else and in what amounts their clients were risking their assets. Cooperation among the brokers was badly needed. Panic spread as anxious traders tried but could not figure out their true risk exposure without knowing the credit status of their counterparties. This was especially true among those most active traders in time bets and wager stock, the most active part of the market in spring 1792. The panic and resulting gridlock forced the economy to a near standstill described by Thomas Jefferson in an April 17, 1792, letter to Thomas Randolph: "In the meantime buildings and other improvements are suspended. Workmen turned adrift country produce not to be sold at any price, because even substantial merchants who never meddled in paper, cannot tell how many of their debtors have meddled and may fail. Consequently they are afraid to make any new money engagements til they know how they stand."

The broken auctioneer-based system was formally replaced after the May 15 settlement day revealed which traders continued to meet their obligations by a new securities trading system organized around the closed circle of still solvent brokers who signed the Buttonwood Agreement on May 17, 1792. Those signing may be a similar group to those signing the earlier agreement (not found) described in Philip Livingston's March 27 letter to Hamilton quoted above. Defaulting traders were not allowed to be a pan of the new system. They were blackballed. Livingston's letter described the penalty for withdrawing funds from the closed trading circle: "and in giving checks to each other, if any one, shall part with the check-except to those, who engage by the agreement, not to draw out Specie, he shall be deemed, infamous-and held up-and that no one of the signers of the agreement will deal with him."

More than likely no one was allowed to sign the Buttonwood Agreement unless he was acceptable to those signing before him, a system which lasted for more than one hundred years at the New York Stock and Exchange Board and its successors.

46. These were the three classes of 3 percent and 6 percent securities exchanged for the Revolutionary War debt under the terms of Hamilton's August 4, 1790, Funding Act. They were by far the most actively traded securities on the Buttonwood signing day of May 17, 1792, the day the NYSE marks as its beginning.
47. Relevant text of Hamilton's unpublished March 22 letter to Seton is in the appendix. The story of the recovery from the first stock market crash has not been adequately reported previously by historians. The recovery is the story of the origin of the NYSE.
48. From the web page of the Depositary Trust and Clearing Corporation.
49. *Papers of Continental Congress*, vol. 17, p. 713.
50. *Papers of Continental Congress*, vol. 19, p. 20.
51. For the American default in Holland, see the correspondence between John Adams and the Dutch bankers on October 16, 1783; December 2, 1783; December 15, 1783; December 23, 1783; December 26, 1783; January 24, 1784; January 29, 1784; and February 4, 1784, in Giunta et al., *The Emerging Nation*, 235–98.
52. Bayley, *The National Loans of the United States*, 17.
53. On that same day, Henry Laurens was exchanged for Lord Cornwallis, the British army commander captured at the battle of Yorktown, in one of the most important prisoner exchanges of the war.
54. Ferguson et al., *The Papers of Robert Morris*, vol. 1, p. 161, 162 note 2, 67, and 72 note 5. For Mor-

ris's own explanation of his conduct in overdrawing European funds see Morris to the Chavalier de la Luzerne (January 13, 1783), vol. 7, p. 300–4.

55. Ferguson et al., *The Papers of Robert Morris*, vol. 1, p. 363–66.
56. Anderson, *The Price of Liberty*, 101–2 for illustrations of federal indents, and 19–22 for a discussion of states voluntarily assuming federal obligations.
57. Ferguson et al., *The Papers of Robert Morris*, vol. 1, p. 125–27.
58. Both in French and English in Ferguson et al., *The Papers of Robert Morris*, vol. 7, p. 319–22.
59. Ferguson et al., *The Papers of Robert Morris*, vol. 7, p. 315–19.
60. Philip Chadwick Foster Smith, *The Empress of China* (Philadelphia Maritime Museum, 1984), 61.
61. Duer intended to be supercargo and partner in the *Empress of China* mission but dropped out. Erna Risch, *Supplying Washington's Army* (Center of Military History, United States Army, Washington, D.C., 1981), 257–58.
62. A treasury auditor's account formerly in the author's possession dated July 24, 1809, signed by Albert Gallatin, secretary of the Treasury, states the amount advanced to Daniel Parker & Company by October 1, 1784 and not accounted for at $38,829.41, and the total claim as of 1809 at $96,430.31.
63. Robert F. Jones, *William Duer King of the Alley* (Philadelphia: American Philosophical Society, 1992), 97.
64. Risch, *Supplying Washington's Army*, 258.
65. Parker may also have illegally removed $2,300 worth of specie from the cargo of the *Empress of China* after it had been officially consigned. See Smith, *The Empress of China*, 115–25.
66. Egan, Clifford. "Daniel Parker: An Exploratory Essay." Paper presented at a meeting of the Society for Historians of the Early Republic, Siena College, Loudonville, New York, 1981.
67. Franklin first secured the monopoly for his grandnephew Jonathan Williams and William Alexander. For the best account of the role that tobacco played during and after the Revolution see Jacob M. Price, *France and the Chesapeake*, 2 vols. (Ann Arbor: The University of Michigan Press, 1973), 700–69.
68. Price, *France and the Chesapeake*, vol. 2, p. 738–69.
69. Sumner, *The Financier*, 173.
70. Price, *France and the Chesapeake*, vol. 2, p. 771.
71. Supply by force: foraging officers found and took required supplies from farmers in the countryside, in return giving a presigned U.S. "certificate" usually at 6 percent interest for the value of the goods taken. See US-122-3 in Anderson, *The Price of Liberty*, 93–94, for examples of certificates.
72. "Carter" was an assumed name. Carter was actually John Barker Church, Alexander Hamilton's brother-in-law, taken as partner by Jeremiah Wadsworth in the military contracting business in 1780 at least partly because he spoke fluent French. Together they became the biggest stockholders in The Bank of North America, the first publicly owned corporation in the United States.
73. French Bill on Tresorier de la Guerre payable to M. Wadsworth et Carter. John Carter Brown Library, B 904 F 13.
74. Ferguson et al., *The Papers of Robert Morris*, vol. 5, p. 478–79.
75. Final settlement certificates were the 6 percent state and United States securities given to Revolutionary War claim holders (mostly soldiers and suppliers) in a specie value settlement of their claims. They were also called "certificates of liquidated debt." They represented the largest part of the Revolutionary War debt (see US 126-146 in Anderson, *The Price of Liberty*, 95–97, for examples). When overseas holders presented these certificates for exchange into the three classes of stock in the public funds of the United States during the implementation of Hamilton's plan to restore the public credit, they were dismayed to find many of the handwritten entries raised to higher denominations or otherwise counterfeited.
76. See Anderson, *The Price of Liberty*, 100–103 for examples of indents.
77. For the best account of these Dutch trusts see Pieter J. Van Winter, *American Finance and Dutch Investment 1780–1805*, 2 vols., trans. James C. Riley (New York: Amo Press, 1977).
78. Charlene Bangs Bickford and Kenneth R. Bowling, *Birth of a Nation: The First Federal Congress 1789–1791* (Madison: Madison House Publishers, Inc., 1989), 61–66.

Additional References

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Ver Steeg, Clarence L. *Robert Morris Revolutionary Financier*. New York: Octagon Books, 1976.

CHAPTER 17. ORIGINS OF THE NEW YORK STOCK EXCHANGE

1. *NYSE Factbook* (New York: New York Stock Exchange, 2002), 42.
2. Larry Neal, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge: Cambridge University Press, 1990), 8–9.
3. P.G.M. Dickson, *The Financial Revolution in England: A Study in the Development of Public Credit, 1688–1756* (London: Macmillan, 1967).
4. A part of the backroom dealing that secured Congress's approval of Hamilton's plan to have the federal government assume state debts involved moving the national capital from New York to Philadelphia for ten years, from 1790 to 1800, and then to a new federal city to be constructed on the banks of the Potomac, Washington, D.C. This deal between James Madison, a representative of Virginia in the House, and Hamilton was brokered by Secretary of State Thomas Jefferson. It garnered enough support from Virginia's and Pennsylvania's representatives to secure passage of Hamilton's previously stalled plan.
5. See Dwight Crane et al., *The Global Financial System: A Functional Perspective* (Boston: Harvard Business School Press, 1995), for a full discussion of financial system functions, which complements the institutional approach of this essay.
6. The weekly data underlying the figures have been collected from contemporary newspapers by Jack W. Wilson, Robert E. Wright, and the author, with support from the National Science Foundation through a grant to the National Bureau of Economic Research. They are part of a much larger database of early U.S. securities prices in several U.S. city markets and in London from the late 1780s to the 1840s. This database is nearly complete and will be made available to other researchers.
7. Quoted with citations by Robert E. Wright, *The Wealth of Nations Rediscovered: Integration and Expansion in American Financial Markets, 1780–1850* (Cambridge: Cambridge University Press, 2002), 83. For another contention that New York was the trend-setting securities market from the early 1790s on, see Walter Werner and Stephen T. Smith, *Wall Street* (New York: Columbia University Press, 1991), 43–46.
8. The broadside is discussed by Werner and Smith, *Wall Street*, and reproduced in their appendix C, 190–91. It is also said to be the first evidence of self-regulation by U.S. securities traders by Stuart Banner, *Anglo-American Securities Regulation: Cultural and Political Roots, 1690–1860* (Cambridge: Cambridge University Press, 1998), 250–51.
9. Both interpretations are discussed by David Jack Cowen, *The Origins and Economic Impact of the First Bank of the United States, 1791–1797* (New York and London: Garland, 2000), chap. 3. Cowen's research is the source of the new interpretation.
10. Quoted by Werner and Smith, *Wall Street*, 24.
11. The act is reproduced in Werner and Smith, *Wall Street*, appendix F, and is discussed in Banner, *Anglo-American Securities Regulation*, chap. 5.
12. Edmund Clarence Stedman, ed., *The New York Stock Exchange* (1905; reprinted New York: Greenwood Press, 1969), 36.
13. See Peter Eisenstadt, "How the Buttonwood Tree Grew: The Making of a New York Stock Exchange Legend," *Prospects: An Annual of American Cultural Studies* 19 (1994).
14. Werner and Smith, *Wall Street*, 218 n.18.
15. I thank Ned Downing, a former stockbroker and author of another chapter in this volume, for helping me to understand the flawed nature of the initial securities trading system of the early 1790s. He discusses the flaws in note 45, chapter 16 (p. 387–88).
16. Werner and Smith, *Wall Street*, 28. Their appendix D reproduces the 1817 articles and subsequent resolutions adopted by the NYS&EB in 1817.
17. Banner, *Anglo-American Securities Regulation*, chap. 8.
18. The development of the call loan market and its relation to securities markets is described in Joseph E. Hedges, *Commercial Banking and the Stock Market Before 1863* (Baltimore: The Johns Hopkins University Press, 1938). See also Margaret G. Myers, *The New York Money Market*, vol. 1, *Origins and Development* (New York: Columbia University Press, 1931).

CHAPTER 18. THE FIRST "EUROBONDS": THE ROTHSCHILDS AND THE FINANCING OF THE HOLY ALLIANCE, 1818–1822

This chapter draws heavily on my book *The World's Banker: The History of the House of Rothschild* (London, 1998), chapter 4. However, as a result of further research, I have been able in a number of respects to correct and to improve the account I gave there of these transactions. I would like to thank the following people for their comments on an earlier draft: Marc Flandreau, Will Goetzmann, Geert Rouwenhorst, Larry Neal, William Silber, and Richard Sylla.

1. David Kynaston, *The City of London*, vol. IV: *A Club No More, 1945–2000* (London 2001), 275. See also Kathleen Burk, "Witness Seminar on the Origins of Early Development of the Eurobond

Market," *Contemporary European History* 1 (1992), 65–88, and Richard Roberts, *Take Your Partners: Orion, the Consortium Banks, and the Transformation of the Euromarkets* (Basingstoke 2001), 8.

2. Clifford Chance, "Eurobonds: An Overview and Documentation," in *London Finance and Capital Markets Practice*, 3.
3. James C. Riley, *International Government Finance and the Amsterdam Capital Market* (Cambridge, 1980), 119–94.
4. For an example of one of the bonds, see Gregory D.L. Morris, "Sold Down the River: The Louisiana Purchase," *Financial History* (Fall 2003): 14–15.
5. Riley, *International Government Finance*, 119–26, 176, 180.
6. See Michael Bordo and Marc Flandreau, "Core, Periphery, Exchange Rate Regimes and Globalization," in *Globalization in Historical Perspective*, ed. Michael Bordo, Alan Taylor, and Jeffrey Williamson (Chicago, 2003), 417–468.
7. Marc Flandreau and Nathan Sussman, "Old Sins: Exchange Rate Clauses and European Foreign Lending in the Nineteenth Century" (discussion paper 4248, Centre for Economic Policy Research, February 2004).
8. Riley, *International Government Finance*, 205–7.
9. Ibid., 214.
10. Ibid., 209.
11. Richard Hellie, "Russia, 1200–1815," in *The Rise of the Fiscal State in Europe, ca. 1200–1815*, ed. Richard Bonney (Oxford, 1999), 502; cf. Hugh Seton-Watson, *The Russian Empire, 1801–1917* (Oxford, 1967), 156, 208.
12. Marten G. Buist, *At spes non fracta: Hope and Co., 1770–1815* (The Hague, 1974), 227–261.
13. Eugene N. White, "Making the French Pay: The Costs and Consequences of the Napoleonic Reparations" (working paper W7438, NBER, December 1999), 12.
14. Riley, *International Government Finance*, 109.
15. Richard Bonney, "The Eighteenth Century, II: The Struggle for Great Power Status and the End of the Old Fiscal Regime," in *Economic Systems and State Finance*, ed. Richard Bonney (Oxford, 1995), 365.
16. James J.Sheehan, *German History, 1770–1866* (Oxford, 1989), 291, 424.
17. Benjamin Disraeli, *Coningsby or the New Generation* (London, 1881), 213.
18. See, on this idea, Flandreau and Sussman, "Old Sins," 3.
19. See, in general, C.A. Macartney, *The Habsburg Empire, 1790–1918* (London, 1969), 205.
20. Rothschild Archive London (henceforth, RAL), T33/383/2, XI/109/5B, Amschel, Frankfurt, to Carl (Dec. 22, 1816); RAL, T61/6/1, XI/109/6, James, Paris, to Nathan, London (Jan. 8, 1817); RAL, XI/109/9/1/76, Salomon, Paris, to Nathan (Jan. 3); RAL, XI/109/9/1/79, Salomon and James to Nathan (Jan. 10, 1818); RAL, T64/338/3, James to Salomon and Nathan (April 9).
21. Count Egon Corti, *The Rise of the House of Rothschild* (London, 1928), 245–49. Rothschild and Parish paid out 35 million Austrian gulden; it was calculated that the state had to repay 76.8 million in interest and amortization, and a further 1.4 million as commission.
22. RAL, T32/91, XI/109/5A, Amschel to Salomon and Nathan, London (Aug. 1, 1816); RAL, T33/305/2, XI/109/5B, Carl, Berlin, to Salomon and Nathan (Nov. 5); RAL, T33/316/2, XI/109/5B, Carl to Salomon (Nov. 11); RAL, T33/342/2, XI/109/5B, Carl to Amschel and James (Nov. 13); RAL, T33/329/2, XI/109/5B, Carl to his brothers (Nov. 15); RAL, T5/178, Carl to Nathan (Jan. 21, 1817); RAL, T5/173, Amschel to James (Jan. 24); RAL, T61/26/1, XI/109/6, Carl to Amschel (Jan. 28). Cf. C.W. Berghoeffer, *Meyer Amschel Rothschild: Der Gründer des Rothschildscher Bankhauses* (Frankfurt am Main, 1924), 206; Corti, *Rise*, 203.
23. RAL, T61/36/1, XI/109/6, Carl, Berlin, to Salomon and Nathan, London (Feb. 6, 1817); RAL, T61/13/2, XI/109/6, Amschel to Nathan and Salomon (March 31). Cf. Richard Ehrenberg, *Große Vermögen*, vol. 1: *Die Fugger, Rothschild*, Krupp, 3rd ed. (Jena, 1925), 80–96, 107; Bertrand Gille, *Histoire de la Maison Rothschild*, vol. 1: *Des origines à 1848* (Geneva, 1965), 70–74; Corti, *Rise*, 210–15.
24. RAL, T63/121/2, XI/109/8, Amschel, Frankfurt, to his brothers (Oct. 16, 1817).
25. RAL XI/109/24/3/4, Rother, Hardenberg & Klewig to Barandon (Nov. 23, 1817).
26. It is not clear to me which form of bond was more common in eighteenth-century Amsterdam.
27. Copy of unsigned letter from N.M. Rothschild, London, to "Sir" regarding Prussian loan (Dec. 30, 1817).
28. RAL, XI/109/10/2/4, Undated loan proposal.
29. RAL, XI/109/9/1/89, Carl to Nathan (Jan. 2, 1818, wrongly dated 1817); RAL, XI/109/9/1/78, Salomon and James to Nathan (Jan. 7); RAL, XI/109/9/1/83, Salomon to Nathan (Jan. 19); RAL, XI/109/9/1/106, James to Nathan (Jan. 19, wrongly dated 1817); RAL, XI/109/9/1/105, James and Salomon to Nathan (Jan. 19).
30. RAL, XI/109/9/1/84, Salomon to Nathan (Jan. 20); RAL, XI/109/9/1/109, James to Nathan

(Jan. 22, wrongly dated 1817); RAL, XI/109/9/1/85, Salomon, Koblenz, to Nathan and James (Jan. 28); RAL, XI/109/9/1/110, James to Nathan (Jan. 29); RAL, XI/109/9/1/111, same to same (Jan. 31); RAL, T64/158/2, Salomon to Amschel, Nathan, and James (Feb. 24); RAL, T64/273/3, Salomon and Carl to Nathan (March 14); RAL, T64/276/3, XI/109/9, Carl to James (March 17); RAL, T64/301/3, XI/109/9, James, Paris, to Nathan and Salomon (March 30). See also Geheimes Staatsarchive Preussischer Kulturbesitz [henceforth GstA], Rep. 74 N XV Nr 47 vol. 1, 34, Nathan to Hardenberg, Berlin (Jan. 15).

31. Transcript of copybook of Benjamin Newton, a City of London Notary. The current whereabouts of the original are unknown. I am grateful to Victor Gray for his assistance in finding this rare transcript of the published loan contract.
32. RAL, T64/182/3, XI/109/9, Carl, Frankfurt, to Salomon, Nathan, and James (April 2, 1818).
33. Eckart Kehr, "Zur Genesis der preußischen Bürokratie und des Rechtsstaats," in *Der Primat der Innenpolitik. Gesammelte Aufsätze zur preußisch-deutschen Sozialgeschichte im 19. und 20. Jahrhundert*, ed. Hans-Ulrich Wehler (Berlin, 1970), 45. See also Herbert Obenaus, "Finanzkrise und Verfassungsgebung. Zu den sozialen Bedingungen des frühen deutschen Konstitutionalismus," in *Gesellschaft, Parlament und Regierung: Zur Geschichte des Parlamentarismus in Deutschland*, ed. Gerhard A. Ritter (Düsseldorf, 1974), 57–75.
34. For an excellent account of the political implications of the loan, see Bernhard Fulda, "The Prussian loan in London 1818: Politics and finance in the late stages of the Prussian Reform period," (BA thesis, Oxford University, 1998).
35. RAL, XI/109/10/3/4, undated documents relating to Prussian loan proposal (c. Dec. 1817) relayed to Rother via Amschel [RAL, General Copy Book 148/6, Nathan to Amschel, Frankfurt (Dec. 2)] and to the Seehandlung via Carl [Nathan to Carl, Berlin (Dec. 2)].
36. RAL, XI/109/9/1/108, James, Paris, to Nathan, London (Jan. 22, 1818).
37. Ernst Klein, "Preußens 30-Million-Anleihe in London vom 31. März 1818," *Zeitschrift für Geschichtwissenschaft* (1956), 582.
38. Peter Gerrit Thielen, *Karl August von Hardenberg, 1750–1822* (Cologne and Berlin, 1967), 358. My emphasis.
39. RAL, XI/109/9/1/85, Salomon, Koblenz, to Nathan and James (Jan. 28, 1818).
40. GStA, I. HA Rep. 92 Db 5 Bd 3, Nathan, London, to Rother, Berlin (May 5, 1818).
41. The loan negotiations of the period after 1815 were quite systematically instrumentalized by the Rothschild brothers in the concurrent campaign to grant equal civil rights to Jews resident in German states: see Ferguson, *World's Banker*, chap. 6.
42. *The Times* (Aug. 4, 1836).
43. See, for example, GStA, I. HA Rep. 92 Ca Nr 20 (32), Carl, Berlin, to Rother (May 12, 1818); Leo Baeck Institute, New York, NMR to Behrend Brothers & Co., Berlin (April 10, 1818); same to same (May 8).
44. RAL, T64/199/3, Carl, Frankfurt, to Nathan and James (April 10, 1818).
45. RAL, T64/301/3, XI/109/9, James, Paris, to Nathan and Salomon (March 30, 1818).
46. Archives Nationales, Paris, 132 AQ 3, Brüderliche Übereinkunft (Aug. 12, 1820).
47. GstA, I. HA; Rep 92 von Rother; Ca Nr 20, Carl to Rother (May 23, 1818).
48. J. Ayer, *A Century of Finance, 1804 to 1904: The London House of Rothschild* (London, 1904), 16.
49. *The Times* (Aug. 4, 1836), 3.
50. RAL, T27/227, XI/109/6/2, Carl, Hamburg, to his brothers (March 4, 1817); RAL, T5/180, Carl to Nathan (March 7); RAL, T62/90/4, XI/109/7, Salomon, Paris, to Nathan (June 9); RAL, T64, XI/109/9/4/10, also XI/109/9/1, James, Paris, to Nathan (July 15). Cf. Gille, *Maison Rothschild*, vol. 1, 65–70, 103–5.
51. RAL, T3/92, D. Guryev (Russian Finance Minister), St. Petersburg, to Nathan, London (Nov. 21, 1819).
52. The names that figure most prominently in the list of subscribers are those of Jewish brokers and merchants, many of them related to the Rothschilds by marriage: Cohen, Mocatta, Stern, Sichel, Worms, Schnapper, Symons, and Samuels. But there are also old Huguenot firms like Rougemont and Cazenove, as well as Scots like Reid, Irving. RAL, T6/23, M. Montefiore, Ramsgate, to Nathan (June 28, 1822); RAL, Cataloguing Box (letter copy book – New Russian 5 percent Metallic Stock etc.), Nathan to Guryev (July 25); RAL, T5/210, Salomon to Nathan (Oct. 7); RAL, Cataloguing Box (letter copy book: Foreign Loans 1823–1831), Nathan to Count Lieven (March 14); same to same, (March 27), and letter of same date to Guryev.
53. RAL, T5/202, Salomon, Vienna, to Nathan (June 12, 1822).
54. See Alan Palmer, *Metternich: Councillor of Europe* (London, 1972), 215.
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ABBREVIATIONS

BL: Beinecke Library, Yale University (see credit for collection)
BLRB: Beinecke Library, Yale University, Rare Books and Manuscripts Collection
BR: Biblioteca Riccardiana
GR: Geert Rouwenhorst
NMC: National Museum of China, Beijing
WG: William N. Goetzmann
YICF: Yale International Center for Finance, Yale School of Management, Yale University

CHAPTER 1

19 Yale Babylonian Collection NBC 8160; 21 Yale Babylonian Collection MLC 113; 22 from *Records from Ur and Larsa dated in the Larsa Dynasty*, Yale Oriental Series, Babylonian Texts, vol. 5, ed. Ettalene Mears Grice (New Haven: Yale University Press, 1919) plate 147; 23 Yale Babylonian Collection NBC 7309; 24 Art Resource ART58459

CHAPTER 2

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CHAPTER 3

45 Silk Road Project, Yale University; 47, 48, 50, 55 Xinjiang Regional Museum, Urumqi, Xinjiang, China; 58 Silk Road Project, Yale University, object held by Xinjiang Regional Museum

CHAPTER 4

76 NMC; 79 from *T'oung Pao Archives: concernant l'histoire, les langues, la geographie, l'ethnographie et les arts de l'asie oreintale, revue dirigée par Paul Pelliot et J.J.L. Duyvendak*, Leiden: E.J. Brill, 1937, ser. 22, vol. 33; 80 Shanghai Museum; 83 left and top from Sen Liu, *Song Jin zhibi shi* (Beijing: Zhongguo zhurong chubanshe, 1993); 83 bottom right from *A Compilation of Pictures of Chinese Ancient Paper Money*, edited by The Inner Mongolian Numismatic Research Institute, "China Numismatics" Editorial Department, trans. Cai Mingxin, (Beijing: The China Finance Publishing House, 1992), 5; 84 from Xianyang Municipal Museum, "Xianyang faxiande Yuandai zhibi," *Kaogu yu wenwu* 1980, no. 3, plate 11; 86 Wuxi Municipal Museum, Wuxi, China; 88 BL, Numismatics Collection, accession no. 20031014-I

CHAPTER 5

92 Anonymous collector; 98 WG; 99 Oriental Museum, University of Durham, U.K.

CHAPTER 6

107 WG; 109 Collection of Victor Neiderhoffer; 112 top National Archives, U.K., E 210/162; E 210/163; CP 25/1/98/55; 112 bottom British Library Cotton Charter VIII.27; 115 all NMC; 116 Genève, Bibliothèque publique et universitaire, P. Gen. inv. 50, Photo Viviane Siffert, Faculté des Lettres, Université de Genève; 118 BL, Franklin Collection; 119 American Philosophical Society; 120 WG

CHAPTER 7

124 BR; 132 BR; 134 BR; 137 BR; 140 BR; 141 BLRB

CHAPTER 8

146 State Archives, Venice; 150 WG; 151 WG; 161 State Archives, Genoa; 162 State Archives, Genoa

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168 University Library Leiden, Thys. Arch. 112 K; 170 BLRB

CHAPTER 10

179–180 BLRB

CHAPTER 11

196 Oscar Gelderblom and Joost Jonker; 199 Amsterdam City Archives; 201 University Library Leiden, Thys. Arch. 112 C 2, nr. 1 (above) and 5 (below); 203 GR

CHAPTER 12

216 BLRB; 217 WG; 221 GR

CHAPTER 13

226 National Portrait Gallery, London; 227 BLRB; 235 BLRB; 236 WG; 237 BLRB

CHAPTER 14

242 GR; 247 GR; 248 GR

CHAPTER 15

251 GR; 252 GR; 255 Amsterdam City Archives; 256 GR; 258 GR; 260 Amsterdam City Archives; 262 GR; 263 GR; 266 GR; 267 GR; 268 GR; 269 WG

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